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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 103 NEW YORK, JULY 11, 1929 Number 2

Where Lies the Blame?

AMONG 178 children and teachers at a public school at Winston, Mo., there were 73 cases of typhoid fever due to pollution of the school well by sewage from the school toilets, and several deaths resulted. The dangerous condition was evident; the report of the state Board of Health says that the fundamentals of sanitation and common decency had been neglected. All that was necessary to start the epidemic was use of the toilets by a typhoid carrier. Neglect of prompt report of the outbreak by local authorities is indicated by the report of the state Board of Health. The county health officer failed to send the board his report of communicable disease for the month of April, and when notified of this omission he made a report on May 6, giving the startling information that there were 26 cases of typhoid fever at the Winston school. Thereupon the board undertook its investigation. In the brief account of this case published by the board no reason is suggested for the delay of the local official, nor does it appear whether there was knowledge or complaint of bad condition of the water at the school. In any case this deplorable condition and its tragic results are a powerful warning. Wherever similar conditions are possible they should be sought out and corrected at the earliest moment.

Old Materials

TWO of the oldest materials used by man in engineering construction were the subjects of special consideration at the recent meeting of the American Society for Testing Materials: cast iron and mineral aggregates. In comprehensive groups of papers the problems and the many unknowns involved in the production and service of these materials were set forth, bringing to view the extensive field for research which they present. Cast iron has for centuries been the prime material of the machine builder, while gravel and broken stone have even longer been the civil engineer's vital necessities in many of his undertakings; yet they have been less fully explored than many materials of far more recent creation. Familiarity with a material, it would appear, does not necessarily give us full knowledge of it, but on the contrary may easily blind us to the need for study, particularly in the case of substances that prove so flexibly adaptable to the varying demands put upon them. Under the increasing competitive pressure upon producer and consumer alike, even the oldest materials, however, put forward new claims on the research investigator, in order that variation may be controlled, quality bettered, and waste of effort in imperfect production and improper use be avoided. The extensive work put upon wood in the last two decades, a just-published X-ray study of firebrick, a projected study of boiler feed water on which some $60,000 per year is to be spent, afford pertinent illustration of the broad opportunities for research which even the commonest materials spread out before the engineer and the scientist. Because of their inherent variability, natural products give occasion for most intensive research; but there is also no dearth of opportunity in products of human craftsmanship, especially such ancient ones as brick and cast iron.

The Outlook Encouraging

REPORTS of productive activity during the first half of the year are in all respects gratifying. The major industries maintained their activity at a high level, with close balance of production and consumption, resulting in a corresponding economic advantage to the community as a whole. Engineering construction also has remained at a high level of activity, increasing in volume by some 20 per cent over the corresponding period of 1928, and balancing the decrease in small residential construction which set in six months ago. Public-works and industrial construction went to larger volumes of expenditure than ever before, and this under favorable conditions, for, despite a financial situation sometimes described as speculative inflation and despite many influences tending to raise current interest rates, the necessary construction financing could be readily accomplished. From this six-month record the outlook may be seen to be most encouraging. The net yield of the nation's large industrial production will seek investment in new plant—public works, factories and machinery. Maintained construction activity, therefore, is in prospect, aided by the remarkably stable conditions in the material and labor markets which characterize the present period. Such labor difficulties as the past three months have brought into view, most recently a determined conflict on the New Orleans street railway system, involve no losses large enough to modify the general showing of profitable productivity, and unless they lead to much more extended movements of dissatisfaction in labor circles they cannot be interpreted as a menace for the future.

Unreasonable Tactics

RATIFICATION of the treaty between the United States and Canada for the construction of remedial works in the Niagara River above the Falls is opposed by Senators from Illinois because Canada objects to the Chicago lake diversion and by Senators from the Northwest because a great part of Canada is decidedly cool to the proposed St. Lawrence ship canal. By no stretch of the imagination can the Niagara treaty be interpreted as having any bearing upon either the Chicago diversion or the St. Lawrence ship canal, nor is it designed for the benefit of Canada alone. It provides for the construction of submerged weirs in the river above the Falls to divert the flow from the center to the sides, which are now bare much of the time, in order to improve the scenic effect and reduce the amount of erosion. The treaty also authorizes the temporary diversion of more water for power purposes from above the Falls than is now being

diverted, in order to determine how much the present diversion can be increased without detriment to the Falls to provide additional power in both Canada and the United States. Both countries stand to gain equally by the treaty. The Senators who oppose it do so not because they think the proposal itself undesirable but simply because Canada is party to it, and because unless Canada agrees with them on the two other propositions they won't agree with her on any. Their attitude is unreasonable, since it is not likely to forward their pet projects. Besides being unreasonable, it is childish.

Pipe Line Progress

MODERN gas pipe line construction as illustrated by the article in this issue describing the 250-mile 20-in. line from the Kettleman Hills field in California to San Francisco presents a striking contrast to usual practices on steel water-supply lines. Any comparison must of course take into account the somewhat more difficult requirements of water line construction, such as deeper trenching and the provision of anchors, but there is nevertheless much that the water engineer can learn from his colleagues in oil and gas service. Gas and oil companies have put in hundreds of miles of pipe to every ten miles of steel water supply main installed. They have encountered nearly every type of corrosive condition in existence; and, being charged with the task of resisting this corrosion in order to reduce depreciation charges, have developed wrappings and other protective coatings of merit. They have been required to complete anywhere from 100 to 200 miles of 20- to 24-in. steel line in six months and consequently have developed machine operation and their construction organization to a degree heretofore unapproached. The water supply engineer, having never been required to work under similar high-pressure conditions, has given much less thought to such subjects as construction organization and operation scheduling. But in view of the increased efficiency that gas line construction enjoys it is reasonable to suppose that the practices of gas and oil companies can be embraced with profit by water supply engineers. Knowledge and appreciation of this source of important data deserves widespread recognition.

Utilize the Waterfront

FAILURE to develop waterfront properties in cities to serve effectively the best interests of the community is widespread, not to say universal. Detroit has been quite as negligent as other cities in this regard, but it seems to be rising to an understanding of the situation. Though the city has a long frontage on a broad and busy stream, at only few places does the public have access to this frontage, and at the same time private development has been haphazard and confused. In a recent report P. A. Fellows, city engineer, speaks of the economic loss resulting from the existing disorder, and emphasizes the need for a program of development. He says: "The failure to provide an authoritative policy has prevented the development of long stretches of waterfront along the upper reaches of the river and has subjected the improvement of other areas to prolonged delays. The chaotic condition has given rise to makeshift structures, sheds and cheap shacks along the riverfront, because of the owners' belief that such buildings might help to carry the taxes and other costs until the ultimate character of the neighborhood is determined. Residential and industrial districts have been indiscriminately mixed, to the detriment of both. Great sums of money have been paid by the city to cover business losses and the cost of structures which had to be removed when it was felt that the uses to which certain parts had been devoted should give way to municipal park improvement." Not only parks make a definite policy desirable, however. The claims of commerce and industry are also greatly affected by a lack of policy, as the Detroit conditions illustrate; at many points commercial and industrial establishments have been crowded out from their proper places along the river, and thereby the adequate development of the city's business machinery has been hampered. A consistent waterfront development plan is important in every city. If drawn up at the earliest possible date and framed on a broad view of future requirements, it will prove a long-time asset to the community.

Fostering Independent Research

APPRECIATION of the necessity for research in modern technical progress is steadily growing, but it remains a difficult question how this work is to draw adequate support. Though the yearly budget of commercial research is increasing and is already counted in tens of millions of dollars, means for supplying funds for independent research remain in unsatisfactory condition. Professor Arthur N. Talbot recently dealt with this difficulty in an address to the American Association for the Advancement of Science; he could give but little encouragement in the way of indicating how better support of independent research is to be obtained.

Commercial research commonly has for its objective new knowledge that can be controlled for the business advantage of the company or group which pays the bills. Independent research seeks knowledge of broad usefulness and of a nature not likely to be controlled as private property. In some respects the two are not sharply separated. Personnel, equipment, methods are more or less similar. A number of companies carrying on commercial research publish some of their results freely; many others collaborate with technical societies, universities and government bureaus in independent researches and contribute financially to their support.

As to independent research, it should be observed that most problems of modern times demand large and costly organization and facilities to furnish the sought-for answers. The single experimenter with his one-man laboratory can contribute but little toward meeting the needs of present-day advance of knowledge; groups, committees or departments with ample finances, capable personnel and adequate tools do the major investigative work. Independent research must therefore be co-operative and large-scale quite as much as commercial research, and requires correspondingly ample support. These statements are true in the civil engineer's field as in others, but the resulting questions are perhaps of greatest moment in civil engineering research.

The two types of research are necessary supplements of each other. Commercial research has a direct incentive, but this is at once its strength and its weakness; it gives the work definite direction and impetus and assures adequate financing, yet at the same time it entrains the inevitable limitations of its objective. On the other hand, independent research, though less definitely directed, is freer in its aims. It is concerned in large measure with

the many researches which lack immediate commercial value but which may prove of wide public or professional application; and, being also without bias, it commands a degree of acceptance not often attainable by commercial research. Both kinds of research are essential, and either one would be in less sound position if the other were to lose strength.

Under present-day conditions the college laboratory is one of the most important elements of independent research. Those which have been evolved into technical experiment stations are particularly effective, and they can be so conducted as to deal with some commercial problems and thereby draw contributory financial support. Experience shows, however, that the activity of these laboratories provides for only part of the research. Other agencies have an important place alongside the college laboratory, among them organizations created to finance research, such as the Engineering Foundation and the National Research Council. Due to inadequacy of funds, to preoccupation with other fields, and to remoteness from the live problems of the day, both organizations are at present less valuable to the civil engineer than they may become in future.

Research within engineering societies is the remaining element, and in some respects the one of greatest potentiality. In the societies there is intimate knowledge of the problems of practice, a growing appreciation of the value of their solution, and ability to co-operate effectively in their study. But these significant advantages lose their effectiveness without some financial support; and at this point the present systems of society organization and management are seriously wanting. The relatively large incomes of the major societies are applied to administrative and service expenditures, all of which yield more immediately tangible returns to the memberships than do appropriations for research.

Thus, the present prospect is disappointing. But it may be that the future will be brighter. Because of the mutual interdependence of commercial and independent research it is possible that those interests which depend primarily upon commercial research may devote part of their appropriations to the support of independent work, in order that their own commercial work may be strengthened. Were the industries to give widespread support to independent research, not only would they draw indirect benefit from the results of this research but their own labors could be made more effective by the strengthening of the whole structure of our investigating agencies.

But may it not also be expected that time will bring an increase in direct society support of research? At the present time the weight of engineering influence in the community is increasing notably and public appreciation of engineering science is rising. If the engineering profession would keep pace with this growth, it must inevitably come to accord higher rank to the search for new knowledge, in order that the level of professional performance may advance correspondingly. Such a view would lead to more effective and energetic organization for fostering research, and to greater financial support than at present.

This means a decided realignment of thought from that which now prevails. It is desirable and necessary, we believe, not only for its meaning to research but quite as much for its relation to the vigor of the technical societies themselves. A conscious seeking after development of better knowledge will strengthen those ideals without which the activities of the societies cannot long flourish.

No Fixed Rule in Valuation

THE Supreme Court definitely declined to lay down any rules in the O'Fallon railway valuation case by which the value of that or any other railroad may be determined. It simply said that *all* the elements of value required to be considered by the law of the land must be considered in making a valuation of the property, including the present cost of reproduction. Further, it added that the weight which must be given to present reproduction cost was not before it—despite the fact that the whole case hinged on that point and was taken to the Supreme Court in the expectation that the court would settle this much disputed question. Can the court then be expected ever to render a decision on this point which will be applicable to all railway valuation cases? A careful reading of the O'Fallon and related decisions indicates that it cannot. More probably the Supreme Court will let the Interstate Commerce Commission give what weight it thinks most equitable to the various elements of value in each railway valuation case.

This conclusion is borne out by the Supreme Court's statement in the O'Fallon decision that "no doubt there are some, perhaps many, railroads the ultimate value of which should be placed far below the sum necessary for reproduction." Obviously, then, the court holds that there are other railroads whose value may equal (or even exceed?) the cost of reproduction. Between these extremes will be almost as many different bases for valuation as there are railroads. Also, the court said in the famous Smyth vs. Ames case that "the original cost of construction, the amounts expended in permanent improvements, the amount and market value of bonds and stock, the present as compared with the original cost of construction, the probable earning capacity of the property under particular rates prescribed by statute, and the sum required to meet operating expenses, are all matters for consideration and are to be given such weight as may be just and right in each case."

The Interstate Commerce Commission was set up to determine the weight which should be accorded to each element of value in "each case," in so far as the railroad valuation work is concerned. The Supreme Court may never be expected to usurp that function. Only when an Interstate Commerce Commission valuation is brought to it for a judicial determination as to whether or not the value assigned to a railroad property is confiscatory or otherwise in violation of the federal Constitution will it be required to determine a value, and then only for its own information so that it may answer yes or no to the question of violation of the Constitution.

It seems apparent, therefore, that too much in the way of clarification of the valuation muddle was expected of the O'Fallon test case. On two points which have been largely overlooked in current discussion of the case the court did help to clarify valuation work. First, the question as to what constitutes a railroad system for purposes of recapture of excess earnings was answered by the finding that the O'Fallon stands alone, as the commission had held. Second, the claim of the railroad's lawyers that excess earnings are not recapturable unless and until the Interstate Commerce Commission has fixed a general level of rates intended to yield a fair return upon the aggregate value of a railroad property was rejected by the court. But on the major point of how to fix a valuation nothing was said which can be construed otherwise than as a declaration that each case must be determined upon its own merits.

Stony Gorge Dam Built Over Fault Subject to Settlement

Ambursen Type Selected as Being Best Able to Resist Destruction in Case of Uneven Settlement or Fault Movement—6-In. Cobbles Used in Relatively Thin Sections—Detailed Costs Given

By J. L. Savage and H. J. Gault
Designing Engineer and Construction Engineer, Respectively, U. S. Bureau of Reclamation, Denver, Colo.

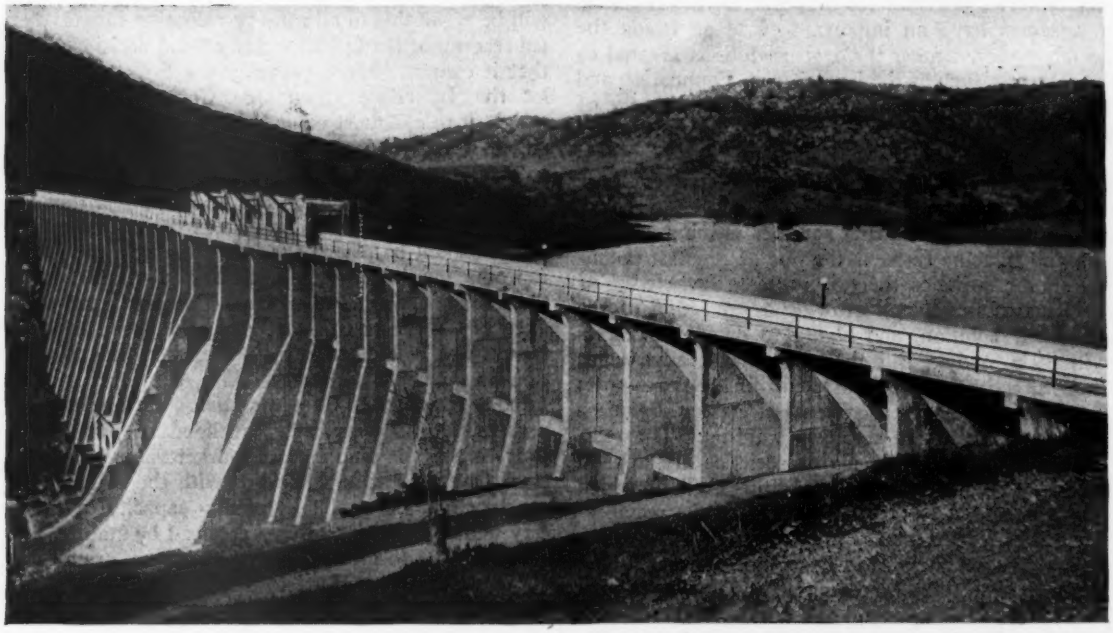


FIG. 1—COMPLETED STONY GORGE DAM OF THE ORLAND RECLAMATION PROJECT IN CALIFORNIA

THE Stony Gorge dam, recently completed in California, has been erected to provide a supplementary water supply for the Orland irrigation project of the U. S. Reclamation Service, now supplied from the East Park reservoir of 51,000 acre-ft., but subject to serious shortages for lack of holdover capacity. The dam is located in the north central portion of California about 125 miles north of San Francisco and about 8 miles west of Fruita, Calif., the nearest point on a railroad line. It is a concrete structure of the Ambursen type 868 ft. in length with an extreme height of 142.5 ft., which will provide a storage capacity of 50,200 acre-ft. An unusual feature of the dam is that it is located directly over an old fault line, a condition which had a controlling effect upon the choice of type.

In the design of the dam a spillway capacity of 30,000 sec.-ft. was adopted, although the largest flood in nine years of record was only 12,000 sec.-ft. The drainage area above the dam is 275 square miles. Comparison with stream records of longer duration led to the belief that 30,000 sec.-ft. spillway capacity was not excessive.

Geological Investigations—A fault line cutting through the low range of hills which forms the reservoir fixed the location of Stony Creek. Since the dam necessarily crosses this fault line, special attention was given to it in the geological investigation and the design of the structure. Carlton D. Hulin, geologist of the University of California, reported on the site in 1926, and A. J. Wiley, consulting engineer, of Boise, Idaho, examined and approved the foundations during the early stages of construction in April, 1927. Professor Hulin stated that the fault is comparatively minor, but that fault movement, though highly improbable, could not be classed as impossible. More serious, he declared, is the possibility that the weight of the dam structure would cause slight settling of the hanging wall of the fault on the north side, which, though it amounted to only an inch, might be quite disastrous to any concrete structure.

In determining the final location of the dam, three major points were considered: suitable foundations for dam and cutoff trench; resistance to erosion of the rock below the spillway apron; and the position of the main and secondary fault lines in respect to the spillway structure, outlet works and buttresses. Six types of structure were considered: rock fill with concrete face; earth fill with concrete core wall; earth and rock fill; concrete gravity section; multiple arch, and Ambursen type. The latter was adopted partly because of its low cost and particularly because of the limited extent of failure likely to result from movement along the fault line. It was felt that the articulated construction of the Ambursen dam would give immunity against failure from

any minor movement along the fault line, because the face slabs act as simple beams spanning from buttress to buttress, and are free to adjust themselves to any slight movement. Thus a fault movement, though it might result in the failure of one or two adjacent bays, would probably not extend beyond the immediate vicinity of the fault line.

All parts of the structure as finally located are situated outside of the main fault line with the exception of one buttress, although secondary faults intersect six others. The spillway section is located on the south side of the fault; the outlet works on the north.

Design

General Dimensions—The Stony Gorge dam is 125 ft. high above the streambed, 142.5 ft. high above the lowest concrete in the cutoff trench, and 868 ft. long. An ogee face slab on the downstream side of the spillway section terminates in a concrete apron which extends 50 ft. below the dam for streambed protection. Hoisting machinery is housed in a gate house over the spillway gates, which also serves to support a traveling crane. The spillway is located in the creek channel, and the needle valve outlets are at about the center of the dam to the north of the creek channel.

In the design, a limiting value of 0.65 was assumed for the sliding factor; actual values vary from a maximum of 0.63 to a minimum of 0.45, and at the maximum height it is 0.60. Horizontal shear in the buttresses was limited to 100 lb. per sq.in., an assumption which controlled the thickness of the buttresses at all elevations except near the top, where a minimum thickness of 18 in. was adopted. Studies of comparative costs with buttress spacing varying from 16 to 24 ft. indicated that the usual spacing of 18 ft. was the most economical for the structure. In the buttresses, the size of the reinforcing bars was kept constant, differences in stress being taken care of by varying the spacing from 12 in. in the top lift to 4 in. in the lower part of the structure. Steel stresses varied from 12,500 to 17,000 lb. per sq.in. Corresponding concrete stresses varied from 380 to 624 lb. per sq.in. The maximum shear in the face slab at the edge of the buttress corbel is 78 lb. per sq.in. Shear reinforcing is taken care of by bending up every third bar in the face slab near the edge of the support.

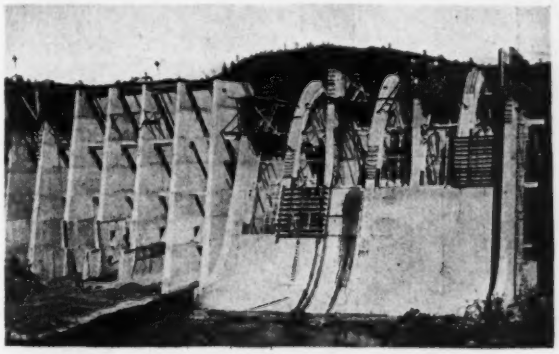


FIG. 2—CONSTRUCTION VIEW SHOWING THE SPILLWAY SECTION

The first design for the buttresses specified ⅝-in. round bars 18 in. on centers placed diagonally and parallel to the face slab in both sides of the buttresses, with ⅝-in. round bars 3 ft. on centers placed vertically in both sides. This method of reinforcement was adopted to resist horizontal shear, to prevent diagonal cracking normal to the upstream face slab and to prevent vertical cracking in the buttresses. It was also considered good insurance against damage by earthquakes. (The dam, during construction, withstood without damage an earth tremor severe enough to be felt by many of the workmen on the job, particularly those on top of the dam.) The early appearance of vertical shrinkage cracks in several of the largest buttresses, however, indicated that the diagonal reinforcing was not sufficient, and it was therefore decided to add horizontal reinforcing in all buttresses below the bottom of the third lift. The horizontal bars were distributed along both faces of the buttresses, approximately 0.3 of 1 per cent of the vertical cross-sectional area of the concrete being provided. This percentage of longitudinal steel appears sufficient to stop all vertical cracking.

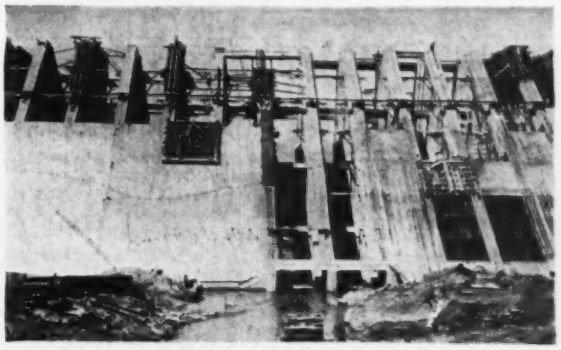
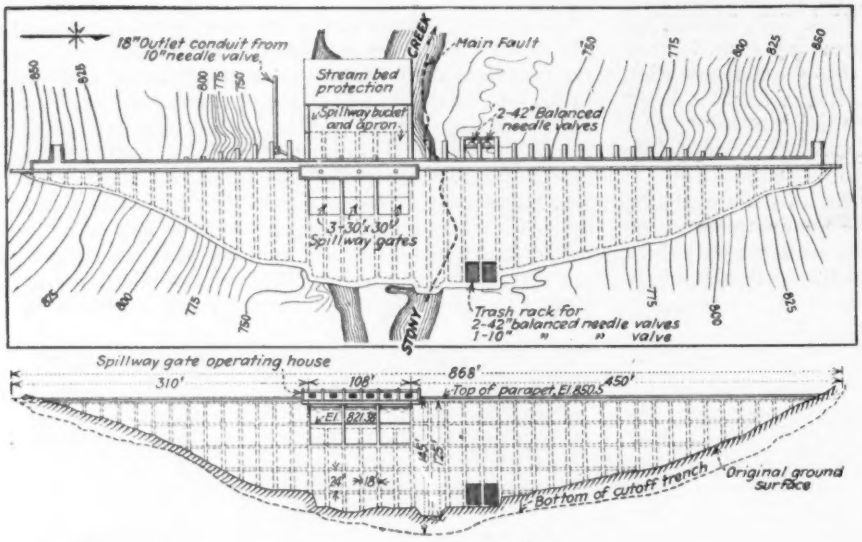


FIG. 3—PANEL FORMS WERE USED ON THE UPSTREAM FACE
Showing trash racks, openings for stream flow and special stop-log supports.

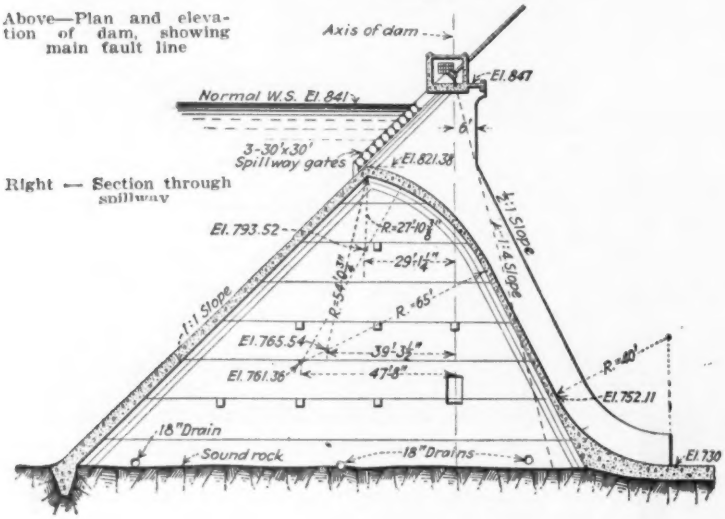
Reinforced-concrete struts 18x24 in. were placed between all buttresses, spaced 24 ft. on centers each way. The option was given the contractor of casting these in place or using precast units. He first chose the precast and afterward changed to monolithic struts due to limited space for a precasting yard. Precast struts were grouted into pockets left in the sides of the buttresses, and monolithic struts were poured directly into similar pockets, which were formed with tapered sides and coated with one coat of water-gas tar to prevent bond with the buttress concrete. The tapered sides of the opening prevent spalling of the edges of buttresses around the strut.

The contraction joint between the face slab and the buttress, consisting of the corbel seat and the keyed side of the buttress tongue, was coated with about ¼ in. thickness of plastic asphalt putty before the face slab was poured. This putty acts as a waterproofing seal for the joint, prevents bond between the concrete of the face slab and that of the buttress and insures against spalling of the edges of the buttress corbel. The corbel seat was also tapered slightly to prevent spalling.

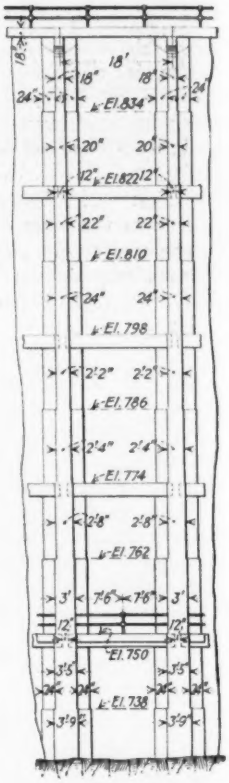
Spillway—Three bays of overflow section in the central portion of the dam provide spillway capacity for 30,000 sec.-ft. Steel caterpillar gates of the overflow type, 30x30 ft., control each bay. These gates are operated by large screw-stem hoists driven by electric motors. A 15-kw. generator driven by a turbine operated from reservoir pressure provides power. The gates are mounted on a 45-deg. slope and slide down the upstream face of the dam in opening. Choice of the overflow type of gate was governed by the large amount of drift, in-



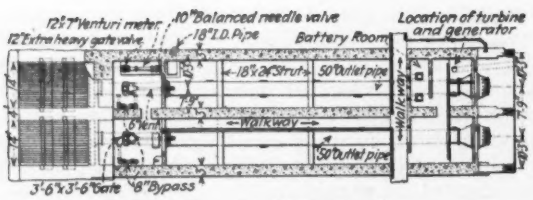
Above—Plan and elevation of dam, showing main fault line



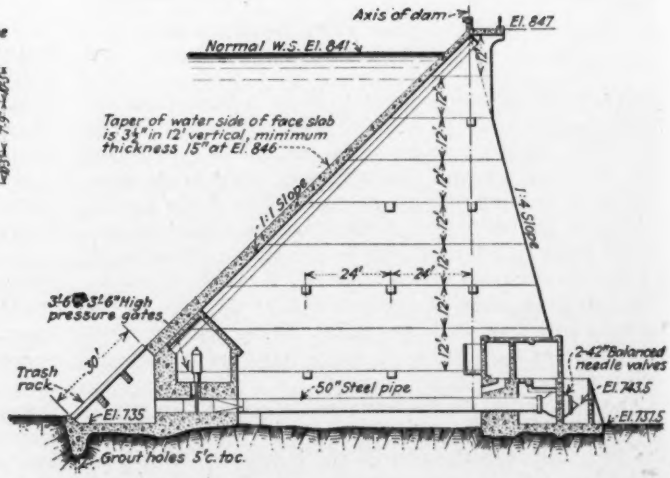
Right — Section through spillway



Above — Elevation of buttress bay at maximum section



Above—Plan of outlet works



Right—Maximum section

FIG. 4—DESIGN DETAILS, STONY GORGE DAM

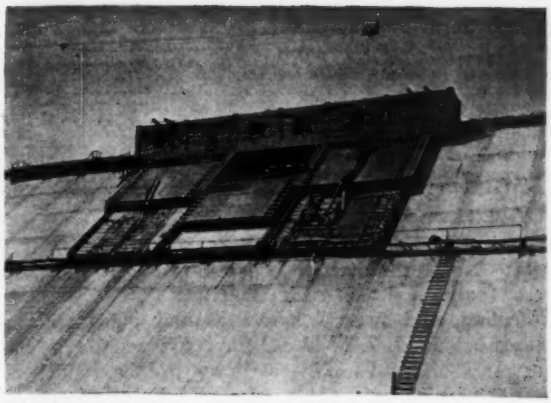


FIG. 5—SPILLWAY GATES OPEN BY SLIDING DOWN FACE OF DAM

cluding an occasional tree, which is carried by the river during the flood stage, and also because with this gate a smaller head is required to pass corresponding floods than with the underflow type. This latter criterion was considered important, due to the flashy floods which are characteristic of Stony Creek and due also to the fact that the spillway gates were not designed for automatic operation.

Outlet Works—The major irrigation outlets have a maximum capacity of 1,050 sec.-ft., and consist of two 50-in. riveted steel outlet pipes extending through the dam. Emergency gates are carried on the upstream end, these being 3 ft. 8 in. square, and 42-in. balanced needle valves are at the downstream end. Each pipe occupies a bay of the dam, and is housed at both upstream and downstream ends for the protection of the valves and equipment. The usual bypass valve and air vent pipes are provided in connection with the emergency gates. Trash racks lying in the same plane as the upstream face of the dam are supported on reinforced-concrete beams. As the construction of the dam destroyed an old diversion dam for a private ditch, a 10-in. needle valve outlet with a capacity of 10 sec.-ft. is provided to replace it. This outlet includes a 12-in. gate valve and a 12-7-in. Venturi meter installed upstream from the needle valve. The whole installation lies within the emergency gate house for the main outlet and in the same bay of the dam with the south main outlet.

Construction

Foundations—Excavation for foundations at the Stony Gorge dam was started Dec. 6, 1926, work being confined to the two abutment structures until after the winter flood season. Cofferdam building was started April 20, 1927. Good rock was disclosed for foundations, but generally at greater depth than was estimated, so that the excavation quantities were considerably increased. The depth of excavation for buttresses varied from 4 to 27 ft. below the original surface, with the greater portion running from 15 to 25 ft. The upstream cutoff trench, with a bottom width of 2 to 6 ft., was from 7 to 29 ft. below original surface, averaging 20 ft. in depth. The downstream cutoff trench below the spillway apron was excavated to El. 720, or 10 ft. below the top of the concrete apron. The main fault line, as exposed by the excavation, appeared to be well healed and tightly filled with clay gouge of about 1-in. thickness.

Cofferdams and Pumping—A small rocky island provided two creek channels for convenient handling of the stream. The north channel was the first to be inclosed by a cofferdam. Streamflow was diverted to the south channel, while buttresses on the north side were brought up to an elevation well above probable high water. The upstream cutoff trench was completed and filled with concrete to above the streambed, excepting two bays which were left 5 ft. lower than the rest to provide for the ordinary flow of the stream. At this point a special closure structure was built of concrete connected with the dam, which provided two rectangular openings 8 ft. x 10 ft. 3 in. to be closed with stop logs. When this had been completed the streamflow was diverted to the north channel, passing through the closure opening, and the south channel was unwatered by additional cofferdams. The remainder of the buttresses and the adjoining upstream cutoff wall were thereafter built up to an elevation well above any expected flood by November, 1927.

Concrete—A gravel bar in Stony Creek ½ mile upstream from the dam site provided a source of concrete aggregate. A crushing, washing and screening plant was set up at one side of the bar, and the material was excavated and conveyed to the plant by dragline scrapers. A belt conveyor elevated the material to the cobble screen, from which the oversize went to the crusher. Cobbles up to 6 in. in diameter were used in the massive portion of the concrete. Gravel, sand and crushed rock were lifted to the smaller screens over the gravel bins by a bucket conveyor. The material was separated into sand, three sizes of gravel, and cobbles. At the plant capacity, materials were furnished for about 24 cu.yd. of concrete per hour.

TABLE I—CONCRETE MIXTURES USED IN STONY GORGE DAM, CALIFORNIA

	No. 1	No. 2	No. 3	No. 4
Cement, sacks	7	7	9	9
Sand, cu.ft.	13.70	13.70	13.70	13.70
Gravel, 6 in., cu.ft.	8.90	10.19	13.02	22.24
Gravel, 12 in. cu.ft.	10.28	10.66	13.42	.....
Gravel, 3 in., cu.ft.	7.99	11.75	.....	.....
Cobbles, 6 in., cu.ft.	6.39	.....	.....	.....
Sum of gravels, cu.ft.	33.56	32.60	26.44	22.24
Proportions, gravel separate	1-1.96-4.80	1-1.96-4.66	1-1.52-2.94	1-1.52-2.47
Proportions, gravel mixed	1-1.96-4.22	1-1.96-4.26	1-1.52-2.78	.....
Average water-cement ratio	0.96	0.97	0.79	0.74
Concrete, cu.yd.	1.325	1.29	1.19	1.127
Average slump, in.	3.00	3.16	4.38	7.50
Required strength, 28 days, lb. per sq.in.	2,000	2,000	2,500	.....
Actual strength, 28 days, lb. per sq.in.	3,300	3,300	4,300	.....

The mixing plant was located on the south hill immediately downstream from the dam. Material was delivered in trucks and dumped into bins constructed over

FIG. 6—VIEW DURING CONSTRUCTION, SHOWING MIXING PLANT BELOW DAM

the mixer. Gravel for each batch was measured by three measuring batchers, and an inundator was used for measuring and saturating the sand.

The mixer discharged concrete into bottom-dump buckets of 1½-cu.yd. capacity. These were pulled by hoists about 75 to 100 ft. to points under the main cableways, of which there were three, spanning the valley. From here the buckets were transported by cableway onto small trucks running on a light track supported on the buttress forms, which delivered the concrete through chutes to any desired point. The mixing time was 1½ minutes per batch; the maximum capacity of the mixing plant 24 batches per hour, which was seldom attained. The cableways were used for handling reinforcing steel and forms as well as concrete. The rate of placing concrete was generally governed by the time required to get the forms ready. This was especially true toward the end of the job, when walls were thinner and volume smaller in proportion to the surface area of the forms. A day's run of concrete varied from 100 to 200 cu.yd., averaging 150 cu.yd. in an eight-hour shift. The greatest amount placed in one month was 4,881 cu.yd. in January, 1928. A night shift was usually employed on the forms and reinforcing steel, and practically all concrete was placed during the day shift. About 1,000 cu.yd. of concrete, including the streambed protection below the spillway, was placed by a small tower and chuting system.

Four different mixtures of concrete were used, as follows: No. 1 for massive concrete in cutoff walls, buttress footings, trash rack structure floors, streambed protection, and mass concrete around gates and buttresses below El. 774; No. 2 for heavy sections such as buttresses above El. 774, spillway training walls, and piers for 50-in. outlet pipes; No. 3 for light sections such as spillway gate-house floor, parapet on top of the dam, upstream face slab, downstream face slab, walks on top of and through dam, and struts between buttresses; No. 4 for very thin sections such as roofs and walls of spillway and outlet gate operating houses. No. 2 was also used in place of No. 1 when no cobbles were available.

Table I shows the proportions, slumps and strengths of these different mixtures.

All materials were washed. The sand was sampled each day and tested for clay, fineness modulus and organic matter. After washing, it usually contained from 1 to 3 per cent of clay, averaging 1.79 per cent. The fineness modulus seldom exceeded 3.25 and did not in any test fall below 2.69. The concrete mixtures were designed to have the desired strength with a large safety margin and with the lowest workable water-cement ratio. No admixture of any kind was used.

Forms for the cutoff blocks, buttress footings and the first lift above, being special, were built in place. Above the first full horizontal joint, the buttresses were built in 12-ft. lifts and panel forms were used. The panels were 14 ft. in height and from 8 to 24 ft. in length, built with 1¾-in. matched lumber for lagging, and lined with galvanized-steel sheets. The top forms for the face slabs were panels 15x18 ft., the under forms being built in place. Forms were secured by steel rods passing through the wall or face slab, the rods being removed the day after placing the concrete. They were slightly tapered to facilitate removal and to provide a wedge effect in the grouted holes. Rods passing through the corbels were run through pipe spreaders which were left embedded in the concrete.

Grouting—Grout was used

TABLE III—COST SUMMARY, STONY GORGE RESERVOIR

Surveys, testing, etc.	$18,700
Right-of-way, lands and roads	174,500
Permanent improvements, cottage, well, etc.	6,600
Dam	967,900
Total field costs	$1,167,700
Engineering and inspection, 7 per cent	81,700
Sub-total	$1,249,400
Superintendence and accounts, 1.2 per cent	15,000
General expense, 2 per cent	25,000
Total	$1,289,400

TABLE II—DETAIL COST ANALYSIS, STONY GORGE DAM

Item No.	Description	Quantity	Contractor Unit Cost	Contractor Amount	United States Unit Cost	United States Amount	Total Unit Cost	Total Amount
1	Diversion and care of river	Lump sum	.....	$100.00	.....	.....	.....	$100.00
2	Excavation, earth and loose rock	11,000 cu.yd.	$2.00	22,000.00	.....	.....	$2.00	22,000.00
3	Excavation, solid rock	25,900 cu.yd.	8.00	207,200.00	.....	.....	8.00	207,200.00
4	Excavation, solid rock	1,700 cu.yd.	8.00	13,600.00	.....	.....	8.00	13,600.00
5	Drilling grout holes 25 ft. deep	2,793 lin.ft.	1.50	4,189.50	.....	.....	1.50	4,189.50
6	Drilling grout holes over 25 ft. deep	1,001 lin.ft.	2.50	2,502.50	.....	.....	2.50	2,502.50
7	Grout pipes, placing	160 ea.	2.00	320.00	$3.03	$485.00	5.03	805.00
8	Pressure grouting	482 cu.ft.	1.00	482.00	0.31	149.00	1.31	631.00
9	Concrete, cutoffs and b. ftgs.	7,402 cu.yd.	6.00	44,412.00	2.58	19,068.00	8.58	63,480.00
10	Concrete, trash rack floors	109 cu.yd.	6.00	654.00	2.58	281.00	8.58	935.00
11	Concrete, apron	1,444.4 cy.yd.	8.00	11,555.20	2.61	3,764.00	10.61	15,319.20
12	Concrete, mass around outlet G	1,758 cu.yd.	6.00	10,548.00	2.62	4,598.00	8.62	15,146.00
13	Concrete buttresses	23,940 cu.yd.	10.20	244,188.00	2.69	64,281.00	12.89	308,469.00
14	Concrete, floor of sp. gate H	171 cu.yd.	10.00	1,710.00	3.87	662.00	13.87	2,372.00
15	Concrete, parapet and piers	159 cu.yd.	18.00	2,862.00	3.51	558.00	21.51	3,420.00
16	Concrete, upstream face slab	6,089 cu.yd.	8.00	48,712.00	3.84	23,382.00	11.84	72,094.00
17	Concrete, spillway training W	194 cu.yd.	15.00	2,910.00	2.71	527.00	17.71	3,437.00
18	Concrete, troxel conduit	161.2 cu.yd.	20.00	3,224.00	3.17	511.00	23.17	3,735.00
19	Concrete, downstream face slab	695 cu.yd.	14.00	9,730.00	3.89	2,706.00	17.89	12,436.00
20	Concrete, walks	373 cu.yd.	16.00	5,968.00	3.82	1,426.00	19.82	7,394.00
21	Concrete, struts	438 cu.yd.	18.00	7,884.00	3.90	1,710.00	21.90	9,594.00
22	Concrete, roofs, walls of operating house	210 cu.yd.	18.00	3,780.00	4.42	929.00	22.42	4,709.00
23	Reinforcing steel	2,232,841 lb.	0.013	29,026.93	0.02	44,912.00	0.033	73,938.93
24	Hauling fine sand	(None hauled)						
25	Emergency gates	73,734 lb.	0.01	737.34	0.145	10,712.00	0.155	11,449.34
26	Placing and painting 50-in. pipes	49,910 lb.	0.01	499.10	0.074	3,711.00	0.084	4,210.10
27	Installing and painting 42-in. needle valves	62,000 lb.	0.01	620.00	0.233	14,451.00	0.243	15,071.00
28	Installing and painting 10-in. needle valve	4,260 lb.	0.03	127.80	0.77	3,285.00	0.80	3,412.80
29	Placing and painting jib crane	2,445 lb.	0.06	146.70	0.198	485.00	0.258	631.70
30	Placing trash racks	37,200 lb.	0.01	372.00	0.037	1,374.00	0.047	1,746.00
31	Placing spillway gates	525,635 lb.	0.01	5,256.35	0.121	63,855.00	0.131	69,111.35
32	Placing and painting traveling crane	8,050 lb.	0.06	483.00	0.10	810.00	0.16	1,293.00
33	Placing and painting pipe hand rail	25,000 lb.	0.025	625.00	0.062	1,557.00	0.087	2,182.00
34	Placing and painting steel stairs	4,445 lb.	0.02	88.90	0.093	416.00	0.113	504.90
35	Placing and painting doors and windows	Lump sum	....	150.00	....	439.00	....	589.00
36	Placing and painting spillway gatehouse	(Eliminated)						
37	Backfill	1,500 cu.yd.	1.50	2,250.00	....	.....	1.50	2,250.00
38	Placing drain pipes	60 lin.ft.	0.50	30.00	....	.....	1.50	30.00
39	Hauling and placing timber walk	(Eliminated)	....	.....	....	.....	....	.....
40	Placing metal conduits 1 in. and larger and fittings	3,300 lin.ft.	0.10	330.00	0.34	1,132.00	0.44	1,462.00
41	Drilling holes and placing anchors	367 lin.ft.	1.00	367.00	....	.....	1.00	367.00
42	Extra work	.....	....	1,500.00	....	.....	....	1,500.00
43	U. S. materials	.....	....	.....	....	4,582.68	....	4,582.68
	Total field cost			$691,141.32	....	$276,758.68	....	$967,900.00

under a pressure of from 90 to 100 lb. per sq.in. in 160 holes, which were drilled in a single line in the bottom of the upstream cutoff trench. Grout pipes 2½ in. in diameter were set over the drilled holes. These were embedded in the concrete of the cutoff trench and the grouting was done subsequently to the pouring of the concrete. The grout was mixed in the proportions of 7½ gal. of water to a sack of cement for the greater part of the work, a small quantity being mixed with 10 gal. per sack. No sand was used.

Cost Analysis—Tables II and III show the cost of the dam and reservoir.

Personnel—The designing work for the Stony Gorge dam was done in the Denver office of the U. S. Reclamation Service by B. W. Steele, engineer on dams, under the general supervision of J. L. Savage, chief designing engineer. Construction work on the dam was under the general supervision of H. J. Gault, construction engineer. R. F. Walter, chief engineer, has general supervision of all engineering work, with headquarters at Denver. Elwood Mead, Washington, D. C., is Commissioner of Irrigation. The contractor was the Ambursen Construction Company, of New York and San Francisco.

Standing Section of St. Francis Dam Razed With Dynamite

System of Drill Holes in Base Loaded With Four Tons of Explosive—Blast Demolishes Concrete Mass 180 Ft. High

THE SECTION of the St. Francis dam which remained standing after the failure of the structure was leveled with a blast of dynamite on May 10, as reported in *Engineering News-Record*, May 23, 1929, p. 845. This central portion was 180 ft. high, about 90 ft. wide and approximately 108 ft. thick at streambed elevation. The method of loading and firing the charges was designed to place the fragments in an excavation prepared along the upstream face. The major portion of the work of demolition consisted in driving two tunnels 12x10 ft. in cross-section about 45 ft. into the block at right angles from the upstream face at an elevation of 12 ft. above streambed. This left three pillars supporting the bulk of the dam, the two outside ones being 19 ft. thick, and the center one, between the two tunnels, 28 ft. thick. The tunnels extended about 12 ft. beyond the vertical projection of the center of gravity so that charges could be placed in a position to tip the mass upstream when the pillars were blasted out. These charges were loaded in a series of holes drilled upward at an angle of about 40 deg. from the back end of each of the tunnels. Additional tilting force was provided by charges placed in another row of holes drilled downward from the back side of the block in the same plane.

These holes were 1½ in. in diameter 3 ft. on centers and were sprung to provide additional space for the explosives. Four rows of horizontal holes 5 ft. apart were drilled into the pillars from both sides of the tunnels to a depth of 12 ft. At the outer end of the tunnels two rows of holes were drilled at an angle of 45 deg. both upward and downward so that the first force of the blast would provide a V-shaped notch across the entire upstream face of the block.

All the holes in the pillars and those in the V-shaped notch were loaded with 40 per cent straight gelatin dynamite, amounting to approximately 1½ tons. The holes in the downstream portion of the block had charges concentrated in the sprung spaces at the bottom, care being taken not to load too close to the ends of the tunnels because of shattering the concrete which was to act as the pivot when the block tilted. These holes were loaded with about 2¼ tons of extra gelatin dynamite. The holes in the upstream portion of the block were arranged to be fired first, followed by the charges in the downstream section to provide tilting force. An excavation 15 to 20 ft. deep was prepared along the upstream face of the standing section to receive the fragments. Bedrock limited the hole to a size insufficient to hold all the pieces.

The result of the shot was the complete demolition of the standing section. A slight tilting movement was noticeable at first; immediately afterward the mass broke up and fell in a heap. The plan to have the pieces fall in the excavation was only partly successful, half the hole being filled, the remaining fragments falling as shown in the accompanying illustration.

The work was done by the Los Angeles Department of Water and Power, R. R. Robertson, assistant engineer of the department, being in charge of the work.

RESULT OF BLASTING THE REMNANT OF ST. FRANCIS DAM
Size of fragments indicated by comparison with figure of man on small block near road.

Heavy Freight Train: (Correction)

In the record of a test run with a heavy freight train on the Chicago, Rock Island & Pacific Railway, in *Engineering News-Record* of May 30, 1929, p. 868, the average speed for the total run of 149 miles was given as 22.78 m.p.h. This should have been 15.28 m.p.h.

Water and Sewage Control for State Institutions

Supervision by Bureau of Sanitary Engineering, State Department of Health, at Expense of Institutions

By George L. Hall and W. W. Blohm

Division Engineer and Assistant Sanitary Engineer, Respectively, Bureau of Sanitary Engineering, Baltimore, Md.

This Article describes an interesting attempt to improve the efficiency of the water-purification and sewage-disposal plants of state institutions in Maryland under the direction of Abel Wolman, chief engineer, Bureau of Sanitary Engineering, Maryland Department of Health. —Editor.

In the 1925 report of the Bureau of Sanitary Engineering of the Maryland Department of Health it was recommended that a fund be provided by small annual contributions from each state institution to pay for supervising the operation of water and sewage treatment plants at these institutions under the direction of the bureau. This suggestion was also advanced by one of the writers (*Engineering News-Record*, Sept. 25, 1924, p. 490) in discussing the water and sewerage construction at state institutions carried on by the bureau.

It had become increasingly evident in the course of our investigations that many of the institutions were lacking in technical personnel of a character equipped to operate adequately water and sewage treatment plants. The care of such plants was usually placed in the hands of the chief engineer of the institution, who already was so burdened with duties relating to the power plant and the maintenance of equipment and buildings that any attention given was relegated to those periods when nothing remained to be done elsewhere. This condition of affairs was encountered at practically all of the institutions. The results, of course, were inadequate and inefficient operation at many of the plants and general deterioration of the equipment. This was the case more particularly with sewage-works, which, located in somewhat out-of-the-way places, were almost forgotten. Practically the only technical supervision the plants received was at the necessarily infrequent inspections made by engineers of this bureau, but as considerable time elapsed between these visits there was no way of obtaining a satisfactory check on the operation. Closer supervision on the part of the bureau was not possible on account of limited appropriation and personnel. Frequent attempts were made, however, to keep in touch with the operation of these plants by having weekly operating reports sent to the bureau.

Since 1914 approximately $400,000 has been expended on the construction of water and sewerage improvements at state institutions under the direction of the bureau. With such a large sum of money invested in works of this nature it would be most unwise to allow them to deteriorate through lack of proper attention. In addition, the state has a responsibility, particularly with respect to the penal institutions and hospitals for the insane, in safeguarding the health of the inmates.

For satisfactory supervision of these plants the full time of one man would be necessary. No funds were available in the budget of the bureau for this purpose, so other means had to be found for obtaining them. It occurred to one of the writers that the institutions might be willing to contribute a small sum annually for this purpose. Past experience had indicated that the chances of obtaining funds out of the budget of the bureau for increases in personnel were not favorable. Furthermore, it was believed that better co-operation would be had from the institutional authorities if their own money were used for this purpose than if the funds were furnished by the state department of health.

Several conferences were held with the superintendents of the institutions to discuss this project. The plan was favorably received and the bureau was requested to prepare a tentative schedule indicating the annual contributions for each institution. As only four of the nine institutions obtained the necessary appropriation from the 1927 legislature the plan was not put into effect during that year. About the middle of 1928 it was decided to take over the supervision of water and sewage treatment plants of these institutions where funds were provided to try out this arrangement. The funds available were not sufficient for the employment of a full-time engineer for this work, but provisions were made for regular monthly inspections, by one of the writers, of water and sewage plants at those institutions already contributing.

When the work was started, in addition to finding the plants in a rather run-down condition, the operators appeared rather indifferent toward our efforts, and one thought the entire burden of operation, as well as supervision, should be placed upon the shoulders of the engineer of the bureau. However, after a few visits the operators have gradually entered into the spirit of the plan and not only are giving their plants more attention but are also making daily the simpler routine tests to aid them. Weekly records are submitted to the bureau on report blanks furnished to each plant. When the occasion demands considerable work on the plants, the engineer remains on the job until it is completed, thereby relieving the operator so that he can attend to other duties.

The improved operation is readily apparent at one sewage-works where formerly the sand beds were overgrown with weeds 4 ft. high. Now the beds are maintained in proper condition, with a noticeable increase in their efficiency. At another institution the sewage-works now receives attention from the operator daily instead of once or twice a month when other duties permitted. The water-filtration plants are being operated with more intelligence than the mere opening and closing of valves formerly demanded. There is still room for improvement, but the results are most encouraging.

Thus far the plan of supervision has met our expectations. After October, 1929, when all of the state institutions are included in the plan, even better results will be possible, because the entire time of the supervising engineer will be devoted to institutional water and sewage treatment plants. The amount of money which will be available for this supervision will be $3,400 per year. Out of this will be paid the salary and traveling expenses of the supervising engineer. The yearly sums allocated to the various institutions vary from $250, where the water supply is chlorinated and the sewage treatment consists of bar screens, grease trap, two-story settling tank and sludge beds, to $600. Two of the institutions are to contribute sums of this latter amount.

The junior author of this article has taken over the duties of part-time supervision of the water and sewage plants at the institutions now included in this arrangement, under the direction of the senior author.

Duration of Rainfall and Sunshine at Baltimore, Md.

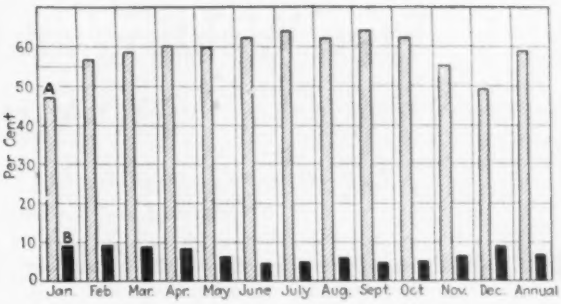
Ten-Year Record Shows Hours of Possible Sunshine to Be Nine Times Hours of Rain—Average Monthly and Hourly Rain

STUDIES of the duration of rainfall and sunshine at Baltimore, Md., for the ten years 1918-27 show that in that city "bright sunshine occurs nine times as much of the possible time as rainy weather occurs, taking the year round." In specific terms, it rained only 6.4 per cent of the total number of hours in a year, "while the bright sunshine hours were 58 per cent of the possible." The primary object of this study, which was made by Roscoe Nunn, Weather Bureau Office, Baltimore, Md., and reported in *Monthly Weather Review*, February, 1929, appears to have been to throw light, as far as might be from Baltimore data, on rainfall duration.

TOTAL HOURS OF PRECIPITATION PER MONTH AT BALTIMORE, MD., 1918-27
Hours with only traces (0.01 in.) excluded

Year	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1918	68.5	27.3	65.2	114.3	25.6	26.6	26.5	21.3	48.4	16.7	18.4	64.6	523.4
1919	65.8	57.7	70.2	38.9	66.8	22.5	57.6	35.2	14.4	67.2	65.5	70.7	632.5
1920	79.4	90.3	63.1	77.8	37.3	48.8	19.7	80.5	30.2	5.0	56.3	48.7	637.1
1921	46.5	53.0	48.4	48.9	73.3	13.9	29.3	29.6	14.2	23.9	82.3	47.9	511.2
1922	67.3	72.9	85.2	24.2	46.5	40.0	37.8	23.7	17.1	20.6	8.7	67.7	511.7
1923	67.7	59.0	71.1	60.2	25.0	17.7	29.5	33.5	32.3	30.3	41.5	76.6	544.4
1924	37.7	52.0	90.5	58.4	84.4	36.3	15.3	28.1	83.2	1.8	21.7	41.5	550.9
1925	93.6	26.7	51.6	50.8	15.6	18.6	35.2	29.4	11.5	76.2	46.3	46.4	501.9
1926	70.5	81.8	54.2	29.4	25.0	21.3	51.9	70.7	47.7	36.7	49.4	68.4	607.0
1927	42.4	69.2	29.5	71.1	42.5	47.8	20.5	45.0	11.6	67.0	32.7	72.5	551.8
Mean	63.9	59.0	62.9	57.4	44.2	29.4	32.3	39.7	31.1	34.5	42.3	60.5	557.2

Mr. Nunn states that before he made the study he shared what he thinks was the common belief that in the eastern half of the United States the duration of rainfall is much greater than it really is, especially as compared with sunshine. He also calls attention to the scanty data bearing upon this subject, and these apparently confined to rainfall. As to rainfall duration he cites only Fassig, "Climate of Baltimore, 1907," and Cox and Armington, "Climate of Chicago." Mr. Nunn asks: "Is it not just as interesting and important to know how much of the time rain falls as to know how much of the time the sun shines brightly? Is it not true that falling rain, or snow, or sleet, is of more concern to outdoor operations in general than is the presence or absence of bright sunshine?"



RELATIVE DURATION OF POSSIBLE SUNSHINE AND OF PRECIPITATION IN BALTIMORE

Average by months for the period 1918-27. Traces of precipitation excluded. *A*—Sunshine. *B*—Precipitation.

From the practical workaday viewpoint, Mr. Nunn concluded that it was advisable to eliminate mere traces of rainfall. The effect of "sprinkling or misting," while a "drawback to outdoor operations," is of slight importance "compared with that of a wetting rain." He found that at Baltimore "one-third of the duration of rainfall is at the rate of only a trace an hour (0.01 in.), reducing the total hours of precipitation in the year from 901 to only 515 when traces are not counted.

During the ten-year period 1918-27 the average precipitation by months, excluding traces, and giving whole numbers, was: January, 64 hours; February, 59; March, 63; April, 57; May, 44; June, 29; July, 32; August, 40; September, 31; October, 34; November, 42; December, 60. In the entire ten years the greatest number of precipitation hours in any one month was 114 for April, 1918, while the least was 1.8 hours in October, 1924. The greatest annual number of hours of precipitation (still excluding traces) was 637 in 1920, and the least 502 in 1925. Percentages by months (average for the ten years) ranged from 8.7 per cent of the time in February to 4.1 in June, the average for the year being 6.4. The accompanying diagram gives a comparison of duration of rainfall and of sunshine at Baltimore, both expressed in percentage of time, but with the sunshine figures given in percentage of possible sunshine, since "the sun works only half the day," on the average, "while rainfall is possible throughout the 24 hours." There is also reprinted here from Mr. Nunn's paper a table showing by months and years the total duration of rainfall in hours at Baltimore, traces excluded; and a second table, showing average hourly distribution of precipitation by months.

AVERAGE TOTAL DURATION OF PRECIPITATION AT BALTIMORE, 1918-27, BY HOURS OF THE DAY AND MONTHS OF THE YEAR
Traces (0.01 in. an hour) excluded

	A. M.												P. M.											
	1	2	3	4	5	6	7	8	9	10	11	Noon	1	2	3	4	5	6	7	8	9	10	11	Midnight
January	2.5	2.8	3.0	2.7	2.6	3.4	3.3	3.6	2.8	2.7	3.0	3.1	2.3	2.7	2.7	2.4	2.1	2.1	2.5	2.6	2.0	1.9	2.5	2.7
February	2.8	2.8	2.8	3.2	2.7	2.6	3.0	3.1	2.7	2.7	2.7	2.3	2.0	2.3	2.1	2.1	1.9	1.6	1.6	1.9	2.1	2.9	2.5	2.5
March	2.4	2.3	3.1	3.1	2.8	2.8	2.8	2.9	3.0	2.7	2.5	2.9	3.0	2.5	2.6	2.6	1.9	2.5	2.2	2.4	2.5	2.7	2.0	2.7
April	2.2	2.5	2.4	2.1	1.9	1.9	2.4	2.6	2.4	2.5	2.5	1.8	1.8	2.3	2.5	2.6	2.4	2.2	2.3	2.8	2.8	2.8	2.9	2.9
May	1.4	1.7	1.7	2.2	2.0	2.2	1.8	1.6	1.4	1.3	1.4	1.7	1.5	1.3	2.0	1.9	2.1	2.0	2.4	2.5	1.6	2.3	2.2	2.1
June	1.5	1.3	1.3	0.8	1.0	0.8	1.0	1.0	0.6	0.8	0.7	1.0	1.0	1.4	1.0	1.3	1.4	1.4	1.5	1.7	2.0	1.6	1.7	1.5
July	1.3	1.7	1.3	1.1	1.1	1.4	1.5	1.1	1.4	0.8	0.5	0.5	1.1	1.6	1.5	1.5	2.4	1.7	1.2	1.4	1.9	1.7	1.5	1.2
August	1.6	1.5	1.5	1.1	1.7	2.0	2.3	1.7	1.7	1.4	1.6	1.5	1.7	1.7	1.1	1.4	1.2	2.3	1.9	2.0	2.0	1.6	1.8	1.5
September	1.4	1.0	1.2	1.0	1.2	1.3	1.5	1.4	1.0	1.2	1.2	1.0	1.1	1.2	1.2	1.2	1.2	1.3	1.5	1.9	1.5	1.4	1.5	1.3
October	1.1	1.1	0.6	1.2	1.2	1.2	1.4	1.5	1.6	1.9	1.6	2.2	2.0	2.1	1.7	1.4	1.4	1.5	1.5	1.3	1.4	1.4	1.0	1.2
November	2.1	2.3	2.1	2.1	1.6	1.8	1.5	1.2	1.8	1.5	1.6	1.7	2.1	1.6	1.9	2.2	1.8	1.7	1.7	1.7	1.6	1.7	1.5	1.6
December	3.2	2.7	3.0	3.2	3.4	3.4	3.2	2.7	2.4	2.5	2.2	2.1	2.5	2.3	2.6	2.3	2.1	2.0	2.0	1.7	2.0	2.3	2.5	2.4
Mean	2.0	2.0	2.0	2.0	1.9	2.1	2.1	2.0	1.9	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.8	1.9	1.9	2.0	2.0	2.0	2.0	2.0

Pipe Welding and Laying Methods on 250-Mile Gas Line

High-Pressure Line 20 In. in Diameter Completed in Six Months—New Wrapping and Testing Devices Speed Up the Work

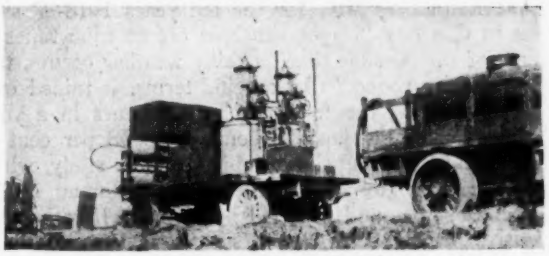
USING new field wrapping and testing devices developed to increase construction speed and with about 100 welders at work along a 250-mile line, the Pacific Gas & Electric Company is building a 20-in. pipe line to bring natural gas from the new central California oil fields to the metropolitan area around San Francisco Bay. The line is the beginning of a $13,000,000 project to provide northern California communities with natural gas. The pipe was ordered in January and it is planned to have the line ready for use by Aug. 1.

The sources of supply are the Buttonwillow and Kettleman Hills gas fields, located approximately 250 miles south of San Francisco. These two fields are to be connected by a 16-in. line, 53 miles long. From the latter field the main line (see map) will start with 22-in. pipe for 41 miles, followed by 20-in. pipe for 203 miles to the lower end of San Francisco Bay. At this point a metering house will be located and a 20-in. branch will extend up each side of the bay to serve the various cities.

Gas will enter the line at 400-lb. pressure and will be delivered at 50-lb. pressure when the line is carrying 60,000,000 cu.ft. in 24 hours. Booster pumps may be installed later when it is necessary to increase the capacity to 110,000,000 cu.ft. Provision is also made for a second 20-in. line from the end of the 22-in. section when the additional supply is required.

A rapid construction program was planned so as to have the line ready by the time several new wells were completed in the Kettleman Hills field. Because of the short time allowed, the right-of-way delays were numerous; in many cases they compelled construction in alternate sections, the gaps being filled after rights had been secured.

Pipe—The pipe line is a completely welded tube without couplings or expansion joints except at a few river crossings where the line is exposed to air temperatures. It is laid in trench with a 2-ft. minimum cover. Exhaustive tests made by the company on underground temperatures in central California indicate that at a depth of 36 in. the annual temperature variation does not exceed 10 deg. This small variation and the method of laying, which places the pipe in compression, have resulted in the adoption of completely welded gas lines as the standard practice of the company.



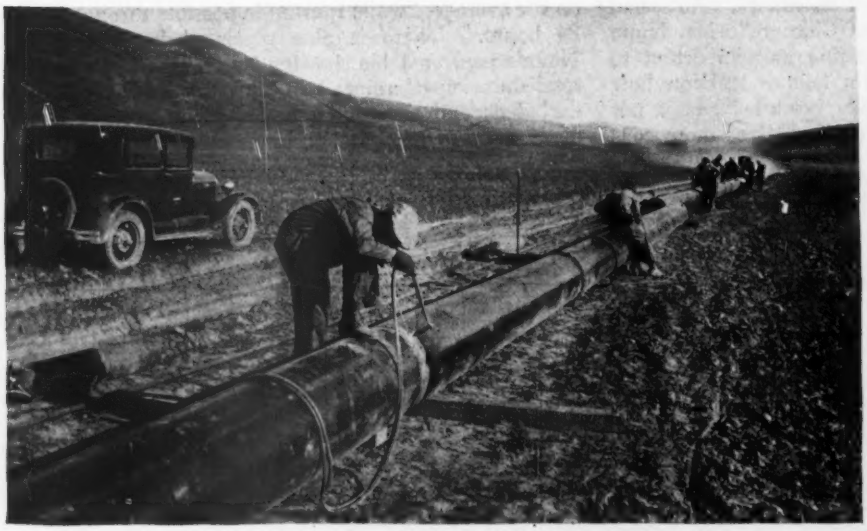
ACETYLENE GENERATOR UNIT FOR WELDING CREW

Oxygen tanks in racks at rear, water supply delivered by truck.

The pipe, in 30-ft. lengths, is of high-carbon steel with electrically welded longitudinal seams; the thickness is $\frac{1}{4}$, $\frac{5}{32}$ and $\frac{5}{16}$ in. respectively, for the 16-, 20- and 22-in. diameter sizes.

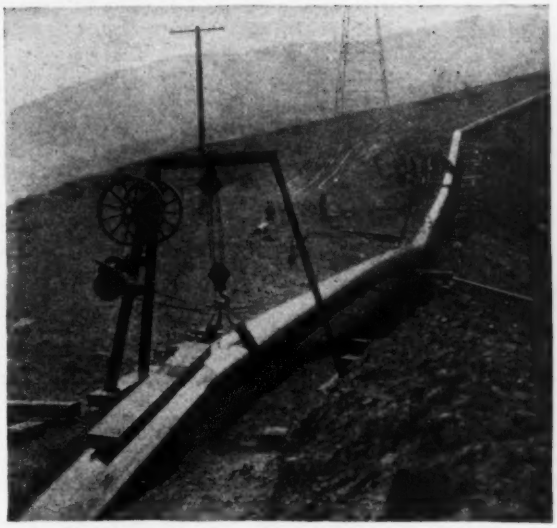
Pipe Wrapping—About 50 per cent of the pipe is wrapped for laying in wet ground or in depressions where water might collect. The rest of the pipe, laid on higher ground with better drainage, is painted but not wrapped. The small portion of the pipe supplied by local manufacturers did not require a rail haul and was wrapped at the plant. The larger portion of the pipe, shipped in full trainloads from the East, was wrapped in the field to avoid damage to the wrapping during the rail haul.

Field wrapping was done by a machine developed and controlled by the Paraffine Companies, Inc., and designed to wrap the 30-ft. lengths of pipe first with tarred felt coated on both sides with asphaltic paint and then with a paper wrapper to keep the pipes from sticking together. To eliminate the loss of time in starting and stopping the machine for each length of pipe, the company developed a system of loading and unloading tables and an automatic coupling device which



WELDING PIPE AHEAD OF TRENCHING

Typical country along southern section allowing extended field operations.

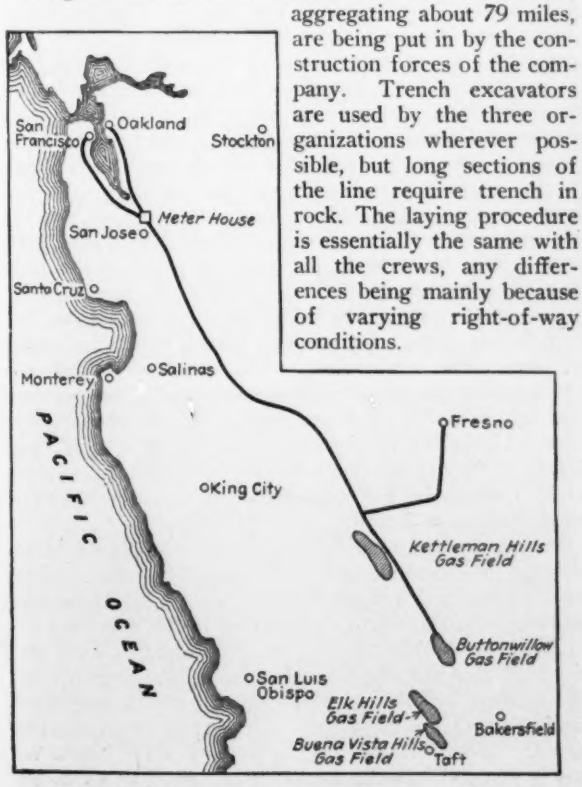


SLINGS USED FOR LOWERING WELDED PIPE
This 500-ft. of pipe contains nine vertical and two horizontal angles, all welded.

enabled the pipes to be fed through the machine without stopping. This increased the output for 20-in. pipe from 3,500 lin.ft. to a maximum of 10,000 lin.ft. in eight hours. The wrapping, including felt and paint, weighs about 2½ lb. per square foot, in place on the pipe.

Short sections under extremely wet conditions were double wrapped. After wrapping, the pipe lengths, weighing about 1,600 lb., were stacked and later hauled by trucks and trailers to the point of use.

Pipelaying—To meet the time schedule, the main line is being laid under two contracts, while the two branches, aggregating about 79 miles, are being put in by the construction forces of the company. Trench excavators are used by the three organizations wherever possible, but long sections of the line require trench in rock. The laying procedure is essentially the same with all the crews, any differences being mainly because of varying right-of-way conditions.

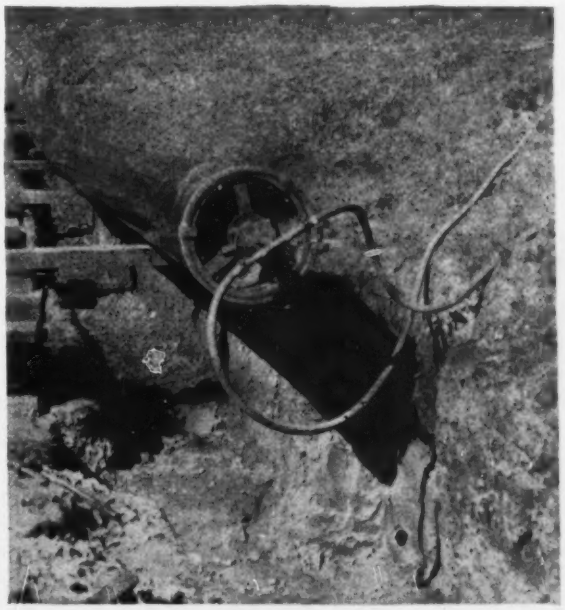


LOCATION OF 250-MILE NATURAL GAS LINE TO SAN FRANCISCO BAY CITIES

The company, operating in more settled territory and often along a state highway, has found it more practicable to keep all operations concentrated in a short distance, opening the trench, laying pipe and refilling within a length of not more than 2 miles. On the other hand the contractors, working on private right-of-way through unimproved, almost unsettled, country have at times strung pipe out for miles in advance of the trench in order to keep plenty of work ahead for the welding crews.

Pipe is distributed along the line by truck and, if the trench is ready, the lengths at ¼-in. clearances are placed directly over it on timber crosspieces and are then ready for welding. If strung out ahead of the trench the pipes are welded into sections on the ground before being placed over the trench.

Welding—The welding operation governs the speed of construction, and progress is proportional to the number of welders available and their efficient organization into crews. The work has been retarded at times by inability to secure sufficient competent welders. New welders added to the company's crews are examined at the shop before being sent out to the job and all welders employed by the contractors must be approved by company inspectors. Besides having general welding ability the applicant must produce a butt weld which will stand a 90 deg.



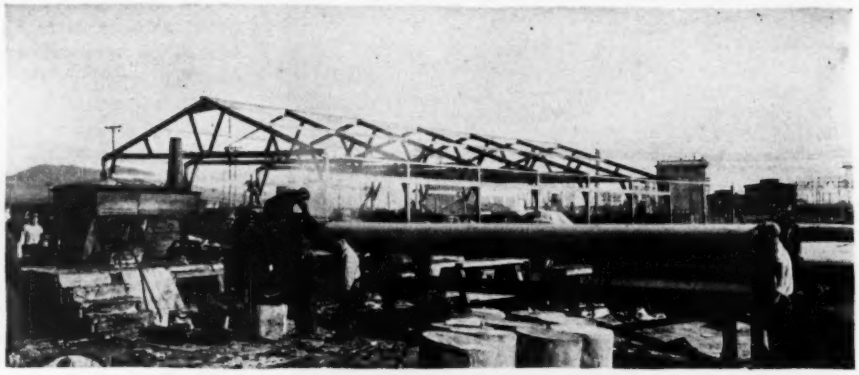
REMOVABLE HEAD FOR TESTING SECTIONS OF PIPELINE
One-mile length being pumped to 100 lb. air pressure.

bend without cracking. The welds are not tested for tension, since tests have proved that their strength far exceeds the tensile strength of the pipe.

The construction plans call for one test specimen per day, to be selected at random from each welder's work. These specimens, about 2x4 in. in size, are cut from the regular welded joints with the weld along the short center line and they are tested by a 90 deg. bend, the inside pipe surface being the outside of the bend. The opening left in taking out the test pieces is closed by welding in a piece of similar size.

Acetylene welding is used exclusively by the company forces, and mainly also by the contractors, but one of

the latter, in an effort to increase laying speed, is using portable electric welding sets to supplement the available acetylene welders. The company is using field acetylene generator sets mounted on trailers which also hold the oxygen tanks. Extending from these generator sets, pipe manifolds are used to supply a crew of four to six welders. One of the contractors uses an individual hand-tank set for each welder.



WRAPPING MACHINE OPERATES CONTINUALLY
Pipe coming through machine at a rate of 10,000 ft. in eight hours.

The welding procedure starts with a tacker, who follows the pipe-placing crew and tacks the pipe ends together at five points joining three to six lengths into sections. Following this man is the main crew of welders, the number depending on the number of lengths which have been joined into one section. With one welder to a joint, helpers roll the section so that the work is continuously at top welding. The tack welds are all burned out and are not included in the finished welded joint.

Care is exercised in organizing the crew to select welders who work at about the same speed; otherwise a slow welder may retard the work of the whole crew. The daily output is from three to a maximum of six welds per man per day. The welds are required to be 1 in. wide and to rise $\frac{1}{8}$ in. above the surface of the pipe.

WELDED PIPE READY FOR LOWERING
Note wrapped pipe in depression for moisture protection.

Preliminary Test—In the next step these sections are connected by the tie-in welding crew into about one-mile lengths, which are then ready for testing. It was formerly the practice to weld a head into each end of a mile section for the test, after which the heads had to be cut out of the pipe. The cost of welding in these heads is about $6 each, and the company eliminated this item by developing a removable head.

This test head consists of an external band to hold the pipe in shape and a diaphragm with a rubber gasket held in position by an internal ring fastened by setscrews to the inside of the pipe as shown in the accompanying illustration. When closed the one-mile section is pumped to a 100-lb. air pressure and all the circumferential joints are inspected for leaks by painting them with soapsuds. If no leaks develop, a recording pressure gage is installed and the section of pipe is required to maintain the 100-lb. pressure for 24 hours, this test pressure being used because it is the limit of the field compressors. Following a successful test the section is ready to be lowered into the trench and covered. At this point it is often possible to time the work so that the air released from a one-mile section which has been tested may be used to put test pressure on the next section, thus saving time and compressor service.

Induced Compression—The pipe is placed in the trench only in the early morning hours, during the period of lowest daily temperature. The section of welded pipe is lowered at the two ends first, the lowering progressing toward the middle, thereby placing the line in compression. If the laying operation extends into the warmer hours of the day the center section is left on the supports and lowered the following morning. Tests made by sawing through the laid pipe show the cuts to close up in all cases, proving the line to be in compression when laid by this method. The first backfilling also is done in the morning hours, after which the trench filling may be completed during the remainder of the day.

Final Test—After laying and backfilling, 5-mile sections of the line are subjected to a second test. Air pressure of 100 lb. is again applied and the pipe must hold this pressure for a week without loss as recorded by gages. Where leaks develop at this stage, ammonia gas is pumped into the section in an effort to locate the leak through the odor of escaping ammonia when the line is patroled. Where this proves unsuccessful (and

also in wet ground, where the ammonia gas would be absorbed), the section is cut in two and the leak is located by testing and further sectionalizing.

Direction—The main line is being constructed under contract by the Lang Transportation Company, of Los Angeles, and the firm of Bechtel & Palmer, of San Francisco. The two branches are being laid by the construction department of the Pacific Gas & Electric Company under the supervision of R. V. Wilson, assistant engineer of distribution. R. S. Fuller, engineer of distribution, is in charge of the project under the direction of W. S. Yard, vice-president in charge of gas construction and operation.

Spain as Seen Through the Eyes of an American Engineer

Good Main Roads Prevail, With Few Tributaries—Picturesque Mingling of Ancient and Modern Methods

By Lazarus White

President, Spencer, White & Prentis, Inc., New York City

THIS is the writer's first visit to Spain, although he has made two previous trips to Europe, visiting Italy, France and countries of northern Europe. Landing was made at Gibraltar after crossing the Atlantic from New York on the "Conte Grande" of the Lloyd Sabaudo Line, a most comfortable way to cross and giving easy access to Spain by way of Algeciras, across the bay from Gibraltar. The writer traveled by bus to Seville and by rail to Granada, Cordova and Madrid, making many side trips to near-by cities.

Spain is a country of wide open spaces, important towns being far apart, 100 miles or more; between them are small compact villages 10 to 15 miles apart. The rest of the country is entirely open, with very few farmhouses or barns and few fences, the stone walls blending into the scenery. Although mountainous, the country seems to be largely plateaus, open and treeless, or with a very thin growth of trees.

In general the aspect of Spain is that of a newly settled country through which a few main highways have been built. There are great stretches of wheatfields, with here and there a herd of cattle, sheep or goats.

OLD ROMAN BRIDGE
This bridge, on the road from Avila to Salamanca, was built in the second century B. C. The bridge in the background was built in about the seventeenth century.

Often for long stretches no crossroads are passed, nor are there other roads to be seen, although a great expanse of country may be under one's eye.

From very early days the inhabitants of Spain have used the backs of horses, mules or donkeys almost exclusively for all kinds of transportation and have developed great skill in devising pack saddles for their work. They raise very fine horses and mules. Even now vast stretches of country lying on either side of the main highways are accessible only by saddle. The Spaniards also use primitive high two-wheeled carts without springs which are hauled by animals in strings of two to six. The carts are similar to those used by the Romans and can travel very rough roads.

DIGGING SAND IN GRANADA FROM RIVER BOTTOM AND LOADING PANNIERS ON BURROS WITH BASKETS

Spain is working vigorously on a new system of highways, which are the old main roads improved, and very much improved, in location, width and surface. For long stretches they will compare favorably with the roads of any other country. However, because of the lack of secondary and tributary roads they present in their traffic a picturesque mingling of ancient and modern scenes. Private touring cars, buses and auto trucks, traveling at top speed, pass strings of mules, ox and donkey carts, proceeding at a slow walk.

As with the traffic, the methods of roadbuilding are a picturesque mingling of ancient and modern. The roads are very carefully located, there being no hesitancy in departing from the line and grade of the old roads. They are wide and straight, with long grades and curves very carefully laid out. The bridges are of ashlar masonry built in the Roman style.

A common form of road in the vicinity of Madrid is as follows:

First, granite curbs about 30 ft. apart are laid to the new line and grade, then a layer of broken stone about 4 in. thick is spread upon the new roadbed, which has been carefully laid and rolled. This in turn is sprinkled and rolled. Then a few inches of a tar macadam which has been mixed in a modern plant is spread and tamped by hand and then rolled with great care, making a very smooth road resembling a newly laid city street. These roads, because of the scarcity of crossroads and railroad crossings at grades, are such as to allow of great speed to any automobile of power.

The mingling of ancient and modern characteristics of Spain is shown in the roadbuilding: Modern crushing and mixing plants are employed, yet stone is hauled in ox carts; crushed stone is delivered by autotrucks,

yet it is spread by men with tiny baskets; men go to the nearest spring for buckets of water to sprinkle the roadbed instead of laying a pipe line; city streets are built with aggregate dug from riverbeds and delivered by strings of jack mules; cement is mixed in modern plants but is delivered one or two bags at a time, on the backs of burros.

As yet the writer has not seen a power shovel in Spain, excavation being made with primitive tools and the material loaded into ox carts and mule carts in tiny baskets. The wheelbarrow, that great help in construc-

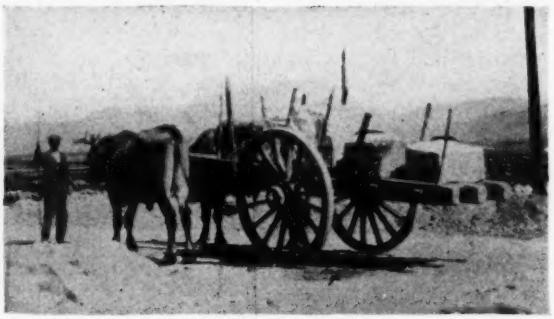
CARRYING SAND FOR ROADBUILDING
One of the oldest methods of transport is used. The scene is the Cordova bridge, an old Roman structure.

tion, is seldom seen here, although it would greatly facilitate hard work. Yet in the village of Avilla centuries ago a very efficient wheelbarrow was invented which is still used there for transporting wine and water.

Nearly all the Spanish work the writer has seen has this saving grace: It is well built and once built will last a long time. The Spaniard, no matter how humble, has a true engineering eye for line and grade and lays his curbing, his courses of masonry and surfaces in such a way as to delight the eye of any engineer at all particular in these matters. He is essentially sound in his methods and only needs to progress farther along the lines he is now taking to arrive at a point which we Americans would call up to date.

One sees here on every hand American influences. Nearly all the automobiles in Spain are of American make; the telephones are controlled by an American

SPREADING STONE WITH BASKETS AND WETTING DOWN MACADAM PREVIOUSLY TO ROLLING WITH STEAM ROLLER



OX CART LOADED WITH STONE FOR ROAD

company, which is making extraordinary improvements; we see American compressors and rock drills; the stores exhibit a great variety of American farm implements. One wonders, however, if the American manufacturers of road machinery, particularly gasoline-driven power shovels, road rollers, mixers, etc., have been here, or if they have, why it is not more apparent.

In general one gets the impression that Spain is having a new birth, that it is essentially a rich country, not at all overcrowded, that the people are hardy, healthy and good workers if rightly guided. At present they have a tendency to work in large gangs, the American method of dividing the men into small gangs supervised by sub-foremen being not as yet apparent. Left to

EXCAVATING FOR ROAD AND LOADING OX AND MULE CARTS WITH BASKETS

himself the Spanish workman will nearly always do a good job, although in so doing he may be surrounded by assistants, or apprentices, whose work consists mainly of looking and waiting to be graduated into the journeyman class.

The one great need of Spain is a system of secondary roads tributary to the main roads now being built so that all fields may be reached by auto trucks, dispensing with the pack saddle—at the expense, alas, of picturesqueness, but inevitable.

Garbage Collection a Government Function

Collection of garbage by a city was held to be a "governmental function," designed "primarily to promote public health and comfort," in a decision of the Virginia Supreme Court of Appeals (Ashbury vs. City of Norfolk, 147 S.E. 223; decided March 21, 1929; abstracted in *Public Health Reports*, May 31, 1929). The decision arose from a suit for damages claimed for personal injury caused by the plaintiff being struck by a runaway horse attached to a municipal garbage wagon.

The Good-View Factor in Stadium Design

An Analytical Method of Design for Stadiums From the Standpoint of Visibility, Including the Development of Clearance and Visibility Formulas for Locating Choice Seats

By Myron Serby
Consulting Engineer, New York City

OF THE several factors necessary to consider in designing stadiums that of providing for every spectator a good view of all points of interest on the playing field is most fundamental and important. It is the writer's purpose to present an analytical method of design which satisfactorily meets the requirements of this good-view factor, which in turn is determined by: (1) freedom from obstructions to vision—that is, good visual clearance; (2) nearness of seats to points of interest; and (3) well-elevated viewpoint above the playing field.

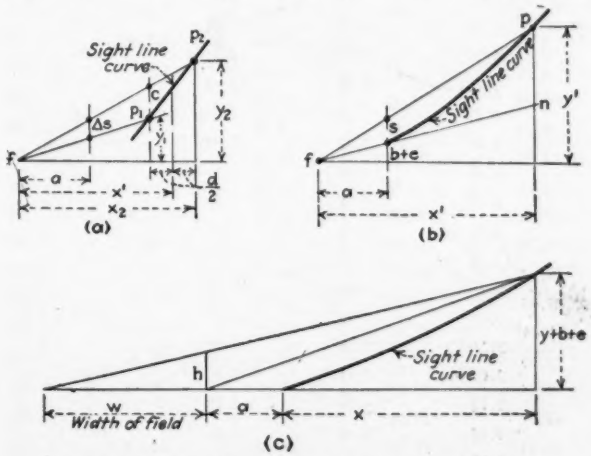


FIG. 1—RELATION OF FOCAL RAYS TO VARIOUS SPECTATORS
Diagrams used to develop designing curves.

NOMENCLATURE FOR DEVELOPMENT OF CLEARANCE FORMULAS

a	Horizontal distance from assumed sight point to spectator in first row of seats. A constant.
b	Vertical distance from assumed sight point to lowest floor elevation of stadium (feet of first spectator).
c	Assumed vertical measurement from spectator's eyes to top of head or hat. Also the vertical clearance from his focal ray to the eyes of the preceding spectator.
d	Width of treads, or back-to-back distance of seats.
e	Assumed vertical measurement from floor to eyes of seated spectator. Equal to sitting height less c.
f	Assumed focal or sight point taken as the origin of the sight line curve.
m	Modulus of common logarithms = 0.4343.
o	Origin of stadium section curve taken e units below eyes of first spectator.
r	Riser height.
$x'y'$	Co-ordinates of sight line curve, with f as origin.
xy	Co-ordinates of stadium section curve with o as origin.
u	A function of x, a, b, e.
z	A function of x, a, c, d.

Freedom From Obstructions—For any stadium section, the position of a spectator seated in the first row largely determines the design, because the sight line curve, a smooth curve that passes through the eyes of spectators, is fixed by the elevation of the eyes of this first-row spectator with relation to some focal point taken as the origin. The focal ray of each spectator clears the eyes of the spectator in front by a vertical distance c. (See table of nomenclature.) Although oblique sections are often necessary, the section is usually taken normal to the front or lower edge of the stadium in plan.

For practical designing purposes, the curve of the sight line will not be in as convenient a position as a curve at the stadium deck e units below the sight line curve. The equation of this latter curve, designated the stadium section curve, can easily be obtained from the sight line curve equation by transformation.

Analytically the sight line curve may be considered as generated by a pair of moving points separated by the tread width d. By means of similar triangles formed as shown in Fig. 1*a*, the algebraic relation between two such points p_1 and p_2 may be expressed as:

$$\frac{y_2}{y_1 + c} = \frac{x_2}{x_2 - d} \qquad (a)$$

and

$$y_2 - y_1 = c + d\left(\frac{y_2}{x_2}\right) \qquad (b)$$

In Fig. 1*b* two given focal rays of fn and fp intercept respectively the vertical distances $b + e$ and $b + e + s$ on a perpendicular at the position of the first-row spectator, so that by similar triangles

$$\frac{y'}{x'} = \frac{b + e + s}{a} \text{ or } y' = \left(\frac{b + e}{a}\right) x' + \frac{s x'}{a} \qquad (c)$$

In Fig. 1*a* the increment Δs is the intercept between the focal rays of any two points p_1 and p_2. Taking x' at the mid-point of the curve between p_1 and p_2, the resulting similar triangles give:

$$\frac{\Delta s}{c} = \frac{a}{x' - \frac{d}{2}} \text{ or } \Delta s = \frac{ac}{x' - \frac{d}{2}} \qquad (d)$$

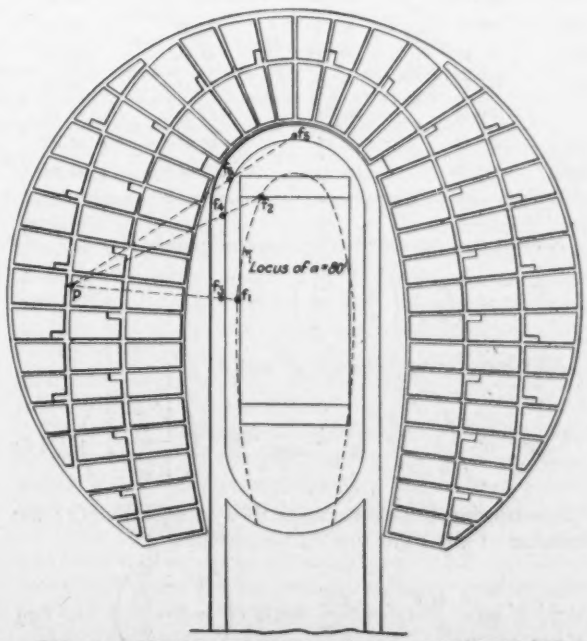


FIG. 2—TYPICAL STADIUM WITH A CAPACITY OF ABOUT 90,000
Design for this structure is illustrated in article.

TABLE I—DESIGN DATA FOR DETERMINING STADIUM SECTION CURVES FOR SECTIONS AS WIDE AS 250 FT.

Table I gives values of z/k for values of a and x in formula 3.

$$z = 1.1513\left(\frac{a+x}{d}\right)\log_{10}\left(\frac{x}{a-\frac{d}{2}}+1\right)$$

For values of $c = 0.5$ ft. and $d = 2.5$ ft. z/k equals z. For other required values of c and d multiply values of z/k from this table by factors k from table Ia.

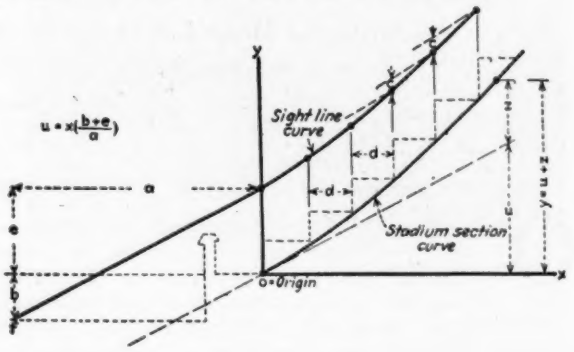


TABLE Ia—SUPPLEMENT TO TABLE I

For use when values of c and d are other than 0.5 and 2.5 respectively.

Values of k

d Inches	c = 0.30′	c = 0.35′	c = 0.40′	c = 0.45′	c = 0.50′	c = 0.55′	c = 0.60′	c = 0.65′	d Inches
28	0.642	0.749	0.856	0.962	1.069	1.176	1.283	1.390	28″
29	0.619	0.723	0.826	0.929	1.032	1.136	1.239	1.342	29″
30	0.600	0.700	0.800	0.900	1.000	1.100	1.200	1.300	30″
31	0.581	0.678	0.775	0.872	0.969	1.066	1.162	1.259	31″
32	0.564	0.658	0.752	0.846	0.940	1.033	1.127	1.221	32″

Values of $z+k$

x Ft.	a=20′-0″	d	a=40′-0″	d	a=60′-0″	d	a=80′-0″	d	a=100′-0″	d	a=200′-0″	d	a=300′-0″	d	a=400′-0″	d	x Ft.
0	0.00	2.56	0.00	2.30	0.00	2.20	0.00	2.15	0.00	2.12	0.00	2.06	0.00	2.04	0.00	2.03	0
10	2.56	3.24	2.30	2.69	2.20	2.49	2.15	2.38	2.12	2.31	2.06	2.16	2.04	2.11	2.03	2.08	10
20	5.80	3.75	4.99	3.04	4.69	2.74	4.53	2.57	4.43	2.47	4.22	2.25	4.15	2.17	4.11	2.13	20
30	9.55	4.15	8.03	3.31	7.43	2.96	7.10	2.76	6.90	2.62	6.47	2.33	6.32	2.22	6.24	2.17	30
40	13.70	4.48	11.34	3.57	10.39	3.16	9.86	2.92	9.52	2.77	8.80	2.42	8.54	2.29	8.41	2.22	40
50	18.18	4.77	14.91	3.79	13.55	3.33	12.78	3.08	12.29	2.90	11.22	2.50	10.83	2.35	10.63	2.27	50
60	22.95	5.02	18.70	3.99	16.88	3.51	15.86	3.22	15.19	3.03	13.72	2.57	13.18	2.40	12.90	2.30	60
70	27.97	5.24	22.69	4.18	20.39	3.66	19.08	3.35	18.22	3.14	16.29	2.65	15.58	2.45	15.20	2.35	70
80	33.21	5.45	26.87	4.34	24.05	3.81	22.43	3.48	21.36	3.26	18.94	2.73	18.03	2.51	17.55	2.40	80
90	38.66	5.62	31.21	4.50	27.86	3.94	25.91	3.60	24.62	3.36	21.67	2.78	20.54	2.56	19.95	2.43	90
100	44.28	5.79	35.71	4.62	31.80	4.06	29.51	3.70	27.98	3.46	24.45	2.86	23.10	2.61	22.38	2.47	100
110	50.07	5.95	40.33	4.78	35.86	4.18	33.21	3.81	31.44	3.55	27.31	2.92	25.71	2.65	24.85	2.51	110
120	56.02	6.09	45.11	4.89	40.04	4.29	37.02	3.91	34.99	3.65	30.23	2.99	28.36	2.71	27.36	2.55	120
130	62.11	6.22	50.00	5.02	44.33	4.40	40.93	4.01	38.64	3.73	33.22	3.04	31.07	2.75	29.91	2.59	130
140	68.33	6.35	55.02	5.13	48.73	4.50	44.94	4.10	42.37	3.82	36.26	3.10	33.82	2.80	32.50	2.63	140
150	74.68	6.46	60.15	5.22	53.23	4.59	49.04	4.17	46.19	3.90	39.36	3.16	36.62	2.84	35.13	2.66	150
160	81.14	6.58	65.37	5.33	57.82	4.68	53.21	4.28	50.09	3.97	42.52	3.22	39.46	2.88	37.79	2.69	160
170	87.72	6.68	70.70	5.42	62.50	4.77	57.49	4.35	54.06	4.05	45.74	3.27	42.34	2.93	40.48	2.73	170
180	94.40	6.78	76.12	5.52	67.27	4.86	61.84	4.42	58.11	4.12	49.01	3.32	45.27	2.97	43.21	2.77	180
190	101.18	6.87	81.64	5.61	72.13	4.94	66.26	4.51	62.23	4.19	52.33	3.37	48.24	3.01	45.98	2.80	190
200	108.05	6.97	87.25	5.68	77.07	5.01	70.77	4.57	66.42	4.25	55.70	3.43	51.25	3.05	48.78	2.84	200
210	115.02	7.06	92.93	5.76	82.08	5.09	75.34	4.64	70.67	4.32	59.13	3.47	54.30	3.09	51.62	2.86	210
220	122.08	7.14	98.69	5.85	87.17	5.15	79.98	4.71	74.99	4.39	62.60	3.52	57.99	3.13	54.48	2.90	220
230	129.22	7.21	104.54	5.92	92.32	5.23	84.69	4.77	79.38	4.44	66.12	3.57	60.52	3.16	57.38	2.93	230
240	136.43	7.30	110.46	5.99	97.55	5.29	89.46	4.83	83.82	4.50	69.69	3.61	63.68	3.21	60.31	2.96	240
250	143.73		116.45		102.84		94.29		88.32		73.30		66.89		63.27		250

Now it can be shown that approximately

$$\delta s = \left(\frac{ac}{d}\right)\left(\frac{dx'}{x'-\frac{d}{2}}\right) \qquad (e)$$

And integrating between x' and a:

$$s = \frac{ac}{d}\int_a^{x'}\frac{dx'}{x'-\frac{d}{2}} = \frac{ac}{dm}\log_{10}\left(\frac{x'-\frac{d}{2}}{a-\frac{d}{2}}\right) \qquad (f)$$

Substituting the above value of s in equation (c) the equation of the sight line curve becomes

$$y' = \frac{b+e}{a}x' + \frac{cx'}{dm}\log_{10}\left(\frac{x'-\frac{d}{2}}{a-\frac{d}{2}}\right) \qquad (g)$$

As stated, this sight line curve equation is not in convenient form for practical designing use, but by transformation is obtained a more convenient curve with coordinates on the stadium floor and origin at the base of the first riser.

The transformation equations are: $x' = a + x$ and $y' = y + b + e$. By substituting these values in the equation of the sight line curve, the general equation of the stadium section curve becomes:

$$y = \left(\frac{b+e}{a}\right)x + \left(\frac{c}{m}\right)\left(\frac{a+x}{d}\right)\log_{10}\left(\frac{x}{a-\frac{d}{2}}+1\right) \qquad (1)$$

For the preparation of design tables this may be written $y = u + z$ where

$$u = \left(\frac{b+e}{a}\right)x = (b + 4.0)\frac{x}{a} \qquad (2)$$

assuming an average value for e of 4 ft. And

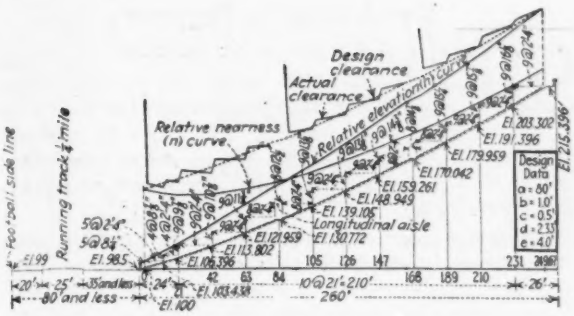


FIG. 3—TYPICAL STADIUM SECTION SHOWING POSITION OF VARIOUS DESIGNING CURVES

$$z = \left(\frac{c}{m}\right)\left(\frac{a+x}{d}\right)\log_{10}\left(\frac{x}{a-\frac{d}{2}}+1\right)$$

$$= 1.1513\left(\frac{a+x}{d}\right)\log_{10}\left(\frac{x}{a-\frac{d}{2}}+1\right) \qquad (3)$$

assuming a value for c of 0.5 ft.

The value of b adopted is an important factor affecting the maximum height of the stadium. It is particularly important in upper decks or balconies. In the above discussion all formulas are based on the assumption that focal points are below o, with b therefore positive in sign. But b may also be negative, as when the focal point is at the breast height of a man on the running track.

In a section where the required elevations, riser heights and tread widths are known it is desirable to have a simple formula to investigate the clearance values From equation (b)

$$c = y_2 - y_1 - d\left(\frac{y_2}{x_2}\right)$$

Since $y_2 - y_1 = r$; $y_2 = y + b + e$; and $x_2 = a + x$.

Then $$c = r - d\left(\frac{y+b+e}{a+x}\right) \qquad (4)$$

Development of Nearness Formula—Optometrists state that under proper lighting conditions normal eyes should distinguish a square object which subtends an angle of five minutes. On this basis, the minimum size of distinguishable objects should be as follows:

Distance in Feet	Size in Feet	Distance in Feet	Size in Feet
100	0.145	600	0.873
200	0.291	700	1.018
300	0.436	800	1.164
400	0.582	900	1.309
500	0.727	1,000	1.454

Since visibility as affected by nearness or proximity varies inversely as the distance from the sight or focal point, the relative proximity of any spectator to that of the first-row spectator may be expressed as follows:

$$N_x = \frac{a}{a+x} \qquad (5)$$

where the relative nearness visibilitiy for the first-row spectator is 1.00 and N_x is the relative nearness visibility of a spectator at point x.

Formulas for Elevation of Viewpoint—The third phase affecting the factor of visibility involves provision for well-elevated viewpoint above the playing field. This phase of visibility is an offsetting factor to the matter of nearness or proximity, rendering it practicable to cover a large area with spectators well back from the points of interest. Lack of elevation usually makes the front-row seats in a stadium relatively undesirable.

Since the width of the field is an important element, elevation of viewpoint may be measured in terms of the height of the perpendicular at the edge of the field intercepted by the two focal rays to the near and far edges of the field respectively. From Fig. 1*c*, by similar triangles

$$h = w\,\frac{y+b+e}{a+x+w} \qquad (6)$$

Since as regards the factor of elevation of viewpoint the top or rear seats are best, h_n may be computed for the top or rear seat, comparing the elevation of viewpoint for other seats with this value as follows:

$$H_x = \frac{h_n}{h_x} \qquad (7)$$

where h_n, the relative elevation of viewpoint for the last-row spectator, is 1.00. For a spectator at any point whose elevation above the field is $y + b + e$, H_x is the relative elevation visibility.

Design Procedure—By the use of the equation of the stadium section curve, Table I has been prepared, giving values of z for values of x from 0 to 250 ft., and values of a for short sights and long sights up to 400 ft. The table is based on c and d values of 0.5 and 2.5 respectively and is correct to two decimal places.

As a supplement to Table I, Table I*a* may be used when other values of c and d are required. It is accurate for all values of c when d equals 2.5. For other values of d there is a maximum error of about 0.3 of 1 per cent. While it may not be considered that this table gives a very close result in some cases, it must be remembered that the values of c and e are themselves very uncertain. When greater accuracy is desired, formula 3 can be used. Table I*a* was computed by considering $d \div 2$ in the logarithmic function of formula 3 as constant and equal to 1.25. On this assumption, for constant values of a and x, z varies directly as c and inversely as d. This approximation would give z values too large when d is less than 2.5 and too small when it is greater than 2.5. By examination, corrections that seemed to the writer to cancel average errors were applied.

Example of Stadium Design—For all engineering works it is customary to use a factor of safety. There should be no exception to this custom in the design of stadiums to give good visibility. For example, if it is absolutely necessary that every seat should offer good clearance visibility, c should be increased at least 10 per cent, using 0.55 ft. instead of 0.50 ft. In designing a stadium three distinct steps are recommended: (1) design of the section; (2) graphical representation of clearance, nearness and elevated viewpoint; and (3) investigation of oblique sights.

Design of the Section—By the use of Tables I and I*a* co-ordinates to the stadium section curve as shown partly in Table II were prepared. The stadium considered was similar to that shown in Fig. 2 with a capacity of about 90,000, with uniform risers for 21-ft. chords and with an over-all width of section of 260 ft. Values for substitution in the stadium section curve equation were as follows: a, 80 ft.; b, 1 ft.; c, 0.5 ft.; d, 2.33 ft.; and e, 4.0 ft.

After the y values were obtained for the section with-

out aisles, the section was adjusted by lowering one riser just beyond the first and second longitudinal aisles respectively. It should be noted that each aisle is double the width of a tread but actually eliminates three rows of seats. One row of seats might be saved by doubling the height of the riser below the aisle, but the danger to the public due to change of tread and riser relationship renders this inadvisable.

Graphical Representation—Using the values given above for the hypothetical stadium, the values of relative clearance, proximity and viewpoint elevation have been computed and partly tabulated in Table III. After values of c, n and h were found, they were plotted on the section, Fig. 3, using the chords to the stadium section curve as the base; c was plotted at double the scale of n and h so that all three curves have the same graphic maximum values. It is obvious that the really choice seats in the stadium are located at or near the intersection of the n and h curves in Fig. 3.

Oblique Sight Points—In actual practice most of the working sights in a stadium are oblique and not normal, as has previously been assumed. To illustrate a method of investigating for such conditions, the computations in Table IV are presented. Point p and the various focal points f_1 to f_9 are taken as shown on Fig. 2. The last four are on the running track and the tabulation gives the relative clearance both for points on the ground and also for a sight point taken at the waist height of a runner. Assuming the latter to be 3 ft., a smaller value of $y + b + e$ is used with b negative in sign. As the maximum reduction in clearance is only 13 per cent, it may reasonably be assumed that a seat at point p would be a good seat. A complete investigation for extreme seats and oblique sights should follow a preliminary stadium design before completing the final drawings. All of the tables given are equally applicable to theater design by using lower values of c for uncovered heads.

Developing the Beginner

GETTING best results out of the new engineering graduate when he begins on his first job is a subject commented upon in the May issue of the *Journal* of the Worcester Polytechnic Institute. The article is addressed to the employer, and calls attention to certain psychological factors as seen from the graduate's viewpoint. Extracts follow:

"Certain young engineers are about to enter your organization. They are men of more than average intelligence and ambition, of more than ordinary promise. Their training has made them alert, industrious and self-confident. It frequently happens that graduation into industry means a plunge into a dull routine that offers few opportunities to exhibit highly trained analytical abilities. If this routine is a necessary step in their progress, as it frequently is, a careful explanation of the fact will create a healthier attitude. These men have a fair amount of common sense, and their judgment will develop in direct ratio to the amount of responsibility that is given them. It is well for them to make some mistakes if the penalties inflicted are not too severe. Make the penalty a heavier responsibility and see how they rise to it.

"Young graduates need not be considered a dead loss during the period of finding themselves. Your business is all new to them, and they are eager to learn it. Idle drifting around the plant is not their idea of learning, however. They have been trained to work hard. You have chosen men from the small group that has survived a long and arduous process of elimination. They are your investment for the future. Handle them intelligently, pay them all they are worth, give them a word of praise when it is merited or of encouragement when it is needed. Some day they will step up and take your job, which is what you had in mind when you hired them."

TABLE II—TABULATED COMPUTATIONS FOR CO-ORDINATES AND RISERS OF TYPICAL STADIUM SECTION
See Tables I and Ia and Figs. 2 and 3

Values of x	x/k for Nearest 10' Values of x	Interpolated x/k Values	$x/k \times k = 1.069$ See Table II	$u = x\left(\frac{b+e}{a}\right) = \frac{x}{16}$	Preliminary Values $y = u + z$	Differences	Computed Riser Values	Number of Risers	Final Riser Values in In.	Final Riser Values in Ft.	Final Differences	Final Values $y = u + z$
0.0	0.00	0.00	0.00	0.00	0.00	3.46						
11.67	2.15	2.55	2.73	0.73	3.46	2.97	0.69	5	8½	0.6875	3.438	3.438
21.00	4.53	4.79	5.12	1.31	6.43	7.36	0.74	4	8⅞	0.7396	2.958	6.396
42.00	9.86	10.44	11.16	2.63	13.79	8.14	0.82	9	9⅞	0.8229	7.406	13.802
63.00	15.86	16.83	17.99	3.94	21.93	8.78	0.906	9	10⅞	0.9063	8.157	21.959
231.00	84.71	85.19	91.07	14.45	105.52	12.08	1.32	9	15⅞	1.3229	11.906	105.583
252.00	94.31	95.28	101.85	15.75	117.60	.....	1.345	9	16½	1.3438	12.094	117.677

TABLE III—TABULATED COMPUTATIONS FOR RELATIVE CLEARNESS, PROXIMITY AND ELEVATION OF VIEWPOINT

x	y	r	$c = r - d\left(\frac{y+b+e}{a+x}\right)$ $y+b+e$	$a+x$	d	$d\left(\frac{y+b+e}{a+x}\right)$	c	$n_x = \frac{a}{a+x}$ n	$H_x = h_x/h_n = 4.15\left(\frac{y+b+e}{a+x+16.3}\right)$ $a+x+w$	h_x
0.0	0.0	0.0	0.0	.....	....	.....	.....	1.000	243	0.085
2.33	0.688	0.688	5.688	82.33	2.33	0.161	0.527	.....	.....	.....
11.67	3.438	0.688	8.438	91.67	2.33	0.215	0.473	0.872	255	0.138
14.0	4.178	0.740	9.178	94.00	2.33	0.227	0.513	0.851	257	0.148
231.0	103.302	1.323	108.302	311.00	2.33	0.812	0.511	0.257	474	0.947
233.33	104.646	1.344	109.646	313.33	2.33	0.816	0.528	0.255	476	0.955
249.67	114.652	1.344	119.652	329.67	2.33	0.840	0.504	0.243	493	1.000

TABLE IV—TABULATED COMPUTATIONS FOR INVESTI GATION OF OBLIQUE SIGHTS FROM POINT p, FIG. 2

Focal Points	x	r	$a+x$	d	$y+b+e = 72.646$ Focal Points at Grade $d\left(\frac{y+b+e}{a+x}\right)$	c	Relative Clearance, Per Cent	$y+b+e = 69.646$ F at Runner's Waist Ht. $d\left(\frac{y+b+e}{a+x}\right)$	c	Relative Clearance, Per Cent
$f1$	163.33	1.198	243.33	2.33	0.696	0.502	100	.....	.....	...
$f2$	200.00	1.198	305.00	2.69	0.640	0.558	111	.....	.....	...
$f3$	163.33	1.198	220.00	2.33	0.768	0.430	86	0.736	0.462	92
$f4$	200.00	1.198	245.00	2.69	0.797	0.401	80	0.763	0.435	87
$f5$	235.00	1.198	395.00	2.99	0.550	0.648	129	0.527	0.671	134
$f6$	235.00	1.198	280.00	2.99	0.775	0.423	84	0.742	0.456	91

Committee Work and Research Results Reported at A.S.T.M. Meeting

Advances Made in the Field of Steel and Wrought Iron—Corrosion of Ferrous and Non-Ferrous Metals—Symposium on Physical Properties of Cast Iron

Engineering News-Record Staff Report

CONCLUDING the report in last week's issue of the meeting of the American Society for Testing Materials held in Atlantic City June 24-28, there are given here the reports of the committees on steel and cast iron, and on corrosion of ferrous and non-ferrous metals; also a summary of the symposium on cast iron. Extensive research work was reported on fire tests of construction materials, on gypsum retarder, on the absorption and penetrability of brick and on elastic calking compounds. Tentative specifications for paving brick were proposed, and a change in the definitions of terms relating to timber was submitted in tentative form.

Since last week's report, committee C-1 on cement has announced its proposed revisions in the present standard for portland cement. These revisions are given at the end of this article.

Steel Testing and Specifications

In the field of steel and wrought iron the meeting was concerned mainly with committee reports. The major committee, that dealing with steel, reported its usual large number of revisions and new tentative standards, but only few touch the civil engineer's work.

The rail specification was slightly revised, and steps were taken to draft a specification for intermediate manganese rail. Steel pipe, boiler tubes and marine boiler plates were also subjects of slight revisions. Tentative standards for structural steel for locomotives and revisions in the specifications for bridge steel, building steel, nickel steel and silicon steel were advanced to standard. No progress was recorded in the effort to raise the strength requirement for structural steel, although a tensile strength of 60,000 to 70,000 in place of the present standard value 55,000 to 65,000 has been under consideration for several years.

Long contention over specifications for high-temperature pipe fittings, revolving around proposed exclusion of crucible and bessemer steel, was ended by adopting a compromise clause requiring the purchaser's approval of process; the steel "shall be made by the electric furnace, open-hearth or other process approved by the purchaser," definite chemical limits are fixed, and the sulphur limit is raised one point to 0.06, making the composition C, 0.15-0.45; Mn, not under 0.50; Si, not under 0.20; P, not over 0.05; S, not over 0.06.

The wrought-iron committee made minor revisions in pipe, boiler tube and staybolt specifications and is undertaking a study of what constitutes quality in wrought iron. The effect of phosphorus in staybolt iron is also under study.

In the matter of magnetic analysis, a research into the relation between magnetic properties and toughness has been started, under the leadership of H. Styri; a chromium steel for ball bearings is the first subject.

Research Results—An extensive series of tests to determine the influence of amount of reduction from ingot to forging was reported by L. H. Fry. Its general showing was that a reduction of 4:1 gave results as good as higher reductions and better than 20:1, as gaged by product of ductility and tensile strength; a 2:1 reduction gave rather low results. It was also concluded that heat treatment is more important than amount of reduction, and that proper proportioning of ingot size to forging is desirable. Billet purchasers should specify at least 3:1 reduction in the ingot.

No new data on effect of sulphur and phosphorus were announced, but current work is to be reported next year by the joint committee that has been at work for a number of years.

To determine the effect of arsenic and tin on high-speed tool steel, service tests were made on drills and cutters by a special research committee. With 0.4 per cent of either impurity, drills proved useless because of torsional weakness, and cutters and reamers also showed injury. An annealed bar shattered when dropped on a concrete floor.

Yield-point testing of steel, which is being investigated by a special committee under Prof. M. O. Withey (University of Wisconsin), was the subject of a comparison of hydraulic and screw machines at various pulling speeds. Aside from a small calibration difference, the two types of machine gave equal results by drop-of-beam.

Bending and impact tests of reinforcing bars were reported by Prof. W. A. Slater and G. A. Smith. They represent an attempt to develop a method for determining the toughness of the bars. A special bending device was used which is claimed to give the same strain for any bar when bent to the same angle. Methods of bend testing also were included in the year's studies of the committee on methods of testing; the value of measured elongation on the outside of the bend is under consideration.

Variations in the determination of proportional limit were studied by R. L. Templin (Aluminum Company of America, New Kensington, Pa.). The value was found to be so erratic that the author concludes that yield-point determinations are to be preferred as a measure of the limit of elasticity. The paper led to some active discussion. Prof. H. F. Moore defined the point at which damage occurs in the material as the point where there is marked change in the stress-strain relation. Ferrous metals which have a sharp knee in the curve have the point of damage defined by this knee, while materials with other types of curve remain subject to arbitrary definition of the damage point, regardless of whether it be called yield point or proportional limit. Dr. L. B. Tuckerman (Bureau of Standards) showed by restudy of the author's data that drawing a band of the width of the least count of the extensometer enables the point of

elastic failure to be located more definitely; but he agreed that proportional limit should not be specified.

Corrosion Studies

Extensive work is in progress in the field of corrosion, both on ferrous and on non-ferrous metals. The exposure tests on uncoated sheets of iron and steel that were begun by committee A-5 years ago are still continuing, tests of rivets in ship bottoms are planned, tests on zinc-coated metal are beginning to show results, metal culvert exposure tests are soon to be started, tests of non-ferrous screen cloth at four locations have been going on for several years, and by fall of this year some 8,000 test pieces of 33 non-ferrous metals will be placed on test racks in seven different locations to determine their resistance to atmospheric corrosion—a test series expected to extend over fifteen to twenty years. Alongside these various tests, studies of galvanic contact corrosion of non-ferrous metals, accelerated tests and other methods of laboratory study paralleling the field exposure are also being conducted by the three committees concerned.

Preserving Corrosion Records—An interesting device for recording corrosion results was described by E. S. Taylerson (American Sheet & Tin Plate Company, Pittsburgh). It consists of making a reverse mold of the corroded surface (first cleaned by light sandblasting and brushed with graphite) in electrotypers' wax, either by pressure or by casting, and then making a copper electrotype in this mold.

Corrosion Results—Twelve years' exposure of uncoated sheets of iron and steel at Annapolis confirms the showing of the exposures at Pittsburgh and Fort Sheridan that copper-bearing metal resists atmospheric corrosion better than non copper-bearing. Immersion tests do not show an advantage of the copper content.

Galvanized sheets at Altoona and Pittsburgh show many failures in 2¾ years; all coatings of 0.75 oz. per square foot have failed and many of 1.25 and 1.50 oz.

Statistical analysis of the uncoated-sheet tests (1916-29) by V. V. Kendall (National Tube Company, Pittsburgh) and E. S. Taylerson, reported in a paper, showed that not only copper but also phosphorus exerted a protective effect against atmospheric corrosion, while neither sulphur nor manganese had much effect one way or the other; in total immersion none of these constituents had any material influence on the resistance of the metal. A probability analysis of the same data, reported by R. F. Passano and A. Hayes (American Rolling Mill Company, Middletown, Ohio), showed clearly that the failures had a time distribution corresponding to the probability law, which emphasizes the necessity of using a large number of samples in an exposure test if reliable results are wanted.

Non-ferrous screen wire cloth at Pittsburgh, Washington, Portsmouth, Va., and Panama shows no failures as yet, and no material change in tensile strength, after several years' exposure.

Fatigue Under Alternating Stress

Quite in line with the steady addition to fatigue knowledge at previous meetings, the present one brought out four important papers.

Dr. D. J. McAdam (Naval Engineering Experiment Station, Annapolis) added to the data of his previous fatigue reports a new group presented under the title "Corrosion of Metals Under Cyclic Stress," relating to ordinary steel, stainless iron, Monel metal and duralumin. The new observations and their analysis by various new forms of plottings throw further light on the reciprocal influence of corrosion and cyclic stress in producing breakdown of the material.

An important contribution to the explanation of the phenomena of simultaneous corrosion and fatigue was made by F. N. Speller, I. B. McCorkle and P. F. Mumma (National Tube Company, Pittsburgh) in a paper, "The Influence of Corrosion Accelerators and Inhibitors on Fatigue of Ferrous Metals." A year ago they showed that chromates are able to neutralize the reduction of endurance limit produced by water, salt solution or other corroding liquid, but that local corrosion such as may result from concentration effects will counteract the inhibitor. Further work since then, on a steel of 0.42 carbon, has confirmed and extended these results, and strengthens the theory that protective surface films, their rupture and their healing are the controlling factors in the so-called corrosion fatigue. It appears also that stainless iron owes its corrosion resistance to a passive film. The authors conclude that the strength of inhibitor required to prevent failure under corrosion fatigue increases considerably as the strength of the corroding solution is increased; that normal chromate is more effective than dichromate; and that the part played by stress in corrosion fatigue is not a direct effect of stress upon corrosion but is due to the breaking of the surface film, which permits electrolytic action to set up active corrosion.

Large-size fatigue testing has been started at the Westinghouse Electric & Manufacturing Company, as reported in "Fatigue Tests of Large Specimens," by R. E. Peterson, of that company. Diameters up to 2¼ in. are being tested; a cantilever machine is used, running at 1,200 r.p.m. It is being applied to electric welds and to models of steam-turbine rotors. Results to date indicate that the large tests produce the same fatigue curves as small ones, but give less scatter due to reduced influence of small defects.

Discussion of this group of papers by Prof. H. F. Moore (University of Illinois), F. N. Speller and others indicated that protective films may also play a part in ordinary or corrosionless fatigue tests, as even in air there may be a slight corrosive notching which could be prevented by a chromate inhibitor. The corrosion-fatigue effect of steam was found to be less than that of tap water, due to the greater purity of the former. A preliminary report by the new research committee on fatigue of metals indicated that study of the current literature will be its principal work for the present. The report re-emphasized the difference between true fatigue and failure of cyclic stress higher than the endurance limit:

> Nearly every investigator who begins the study of fatigue of metals is impressed with the ease and speed of making tests by applying a repeated high stress of some definite magnitude to specimens of different metals and noting the length of endurance of each metal. The committee wishes to point out that as a measure of the ability of metals to withstand repeated working stresses this method is utterly unreliable. Under severe overstress, the length of life of a material depends fully as much upon ductility as upon fatigue strength. If a series of metals were tested in this way and the metals listed in the order of length of endurance, this list would not, in general, show the arrangement of the same metals in order of fatigue strength under working stresses.

Cast-iron fatigue tests reported by Prof. J. B. Kommers (University of Wisconsin) showed an average endurance limit equal to half the tensile strength and one-fourth the modulus of rupture. With repeated

compressive stress (range from zero to maximum) the fatigue stress was 65,000 lb. per sq.in. with reversed bending 10,500 (range 21,000) and with repeated tension 15,500 lb. per sq.in. "Coaxing," or repeated stressing below the endurance limit, raised the endurance limit by 16 to 43 per cent. About 20 million cycles of understressing produce the maximum effect. Grooves and holes were found to have much less effect on endurance strength than stress calculations would indicate, and in some cases they actually increased the endurance limit.

Fatigue of Non-Ferrous Metals—In a paper on the fatigue of non-ferrous sheet metals John R. Townsend and Charles H. Greenall state that the fatigue endurance limit varies from approximately 12 to 36 per cent of the tensile strength, whereas the commonly accepted ratio of fatigue endurance limit to tensile strength of steel is in the neighborhood of 40 per cent of its tensile strength. High tensile strength or proportional limit is not a sufficient guarantor that the material will perform satisfactorily in service. The ratio in the case of steel, according to Dr. McAdam, should be 45 or 50 per cent.

Various Research Work

Absorption and Penetrability of Brick—Studies on the relation of water absorption to the penetrability and frost resistance of building brick were reported by J. W. McBurney (Common Brick Manufacturers Association). His conclusions are that the apparent porosity of brick is not a measure of its resistance to climatic action except for similar materials or methods of manufacture. Schurecht's ratio (water absorption in 48-hour cold immersion to water absorption in five-hour boiling) is a better measure but still not sufficiently reliable to furnish a basis for classification. In discussion of this point T. C. Taylor reported comparisons of old brick at Detroit in which it was found that there was little difference between the amount of water absorbed by sound and by disintegrated brick of the same make, but a wide difference in the amount absorbed by either sound or unsound brick of different makes.

On the subject of the penetrability of brick in walls Mr. McBurney believes that minute openings in walls such as hair cracks in joints, defective joints, etc., are the most important factors and are much more likely to be the cause of dampness on interior surfaces than the penetrability of the bricks themselves. This view was supported by L. B. Lent. D. K. Boyd recommended further studies of the absorption of brick wall surfaces under service conditions.

Mixing Temperature of Asphalt—Studies to determine the effect of mixing temperature on the physical properties of oil asphalt in sheet asphalt mixtures were reported by John H. Bateman and H. L. Lehmann. Their work was undertaken as an outgrowth of the damage done in recent years to asphalt pavements by the use of high temperatures in attempts to increase the plasticity of the stiff mixtures that are now commonly used.

Elastic Calking Compounds—Results of tests upon 30 different calking compounds for use in exposed joints in masonry and around window and door frames were reported by H. H. Dutton, research associate of the Indiana Limestone Company at the Bureau of Standards. The results so far indicate that only four of the compounds will meet the requirements of adhesiveness, elasticity and permanence. In discussion it was pointed out that architects could do much toward insuring satisfactory results from calking compounds by detailing joints in such a way that an adequate amount of the compound can be placed in each joint.

Fire Tests of Construction Material—Extensive experimental work is under way, according to the committee on fire tests of materials of construction, on tests of such material, but the committee is not yet ready to report on definite test requirements. A new laboratory test for measuring the fire resistance of wood was reported by T. R. Truax and C. A. Harrison.

Uses of Gypsum—Results of tests made by the U. S. Bureau of Mines on the use of gypsum-anhydrite mixtures as retardants in portland cements were reported by the committee on gypsum. The results indicate that the type of natural anhydrite has very little significance, but that the fineness of the retarder is of considerable importance, especially as regards its effect on the plasticity of the mortar. In view of this the studies are to be continued at the New Brunswick station. The same committee reported that it co-operated during the past year with the United States Bureau of Standards in an extensive series of tests to determine the ultimate stresses in gypsum fiber concrete. These tests have been completed and the results will be published in the near future by the bureau.

Symposium on Cast Iron

Cast Iron—The physical properties of cast iron were the subject of a symposium which took up the greater part of one session. Among the points covered were the effect of section and various compositions upon the physical properties of cast iron, correlation of castings and test bars, static strength of plain and alloy cast iron, elastic and fatigue properties, impact and wear tests, machinability, corrosion and heat treatment. A point of unusual interest was the statement by R. S. MacPherran that specimens of low-silicon gray iron and soft high-silicon gray iron are much harder at the sides than at the center, but that a high-test cast iron has equal Brinell hardness throughout; also that the tensile strength of this high-test cast iron was found to decrease as the thickness of the bar increased.

A group of interesting diagrams to show the effect of alloys upon cast iron was presented by F. B. Coyle in a paper on its static strength. Curves showing a striking correspondence between the amount of plastic deformation and the amount of graphite in cast iron were shown by J. T. MacKenzie. He suggested that it is probable that the crushing of graphite flakes is responsible for the plastic deformation under load. This conclusion was questioned by J. W. Bolton, who said that a similar deformation or set takes place in steel.

Studies looking toward a satisfactory impact test were reviewed by H. Bornstein, and a review of wear testing was given by A. L. Boegehold. Mr. Bornstein stated that he hoped by next year to be able to recommend a standard wear test.

Machinability of cast iron was discussed by E. J. Lowry. He believes that increased abrasive resistance decreases the machinability of cast iron, but increase in the uniformity of hardness increases its machinability. Annealing helps machinability but too much decreases the strength.

On the subject of corrosion, H. O. Forrest stated that the rate of corrosion of cast iron does not vary with the method of manufacture or the chemical composi-

tion. The main factor is the type of protective coating and its continuity.

Specification Changes Proposed

Paving and Building Brick—A complete revision of several sections of the tentative specifications for paving brick as published in the report of the committee on brick was approved by the society for publication as a tentative standard. Tentative specifications for clay and shale building brick were advanced to standard and specifications for sand-lime brick were continued as tentative pending further laboratory studies on physical properties. Objection to separate specifications for sand-lime brick was voiced by T. C. Taylor, also objection to the inclusion of both a crushing strength and a modulus of rupture test in the specifications. Mr. Taylor favored the use of the latter. On this point J. W. McBurney stated that studies by the Common Brick Manufacturers Association indicate that the flat compressive strength of individual clay bricks is a better measure of wall strength than modulus of rupture.

Timber—Definitions of terms relating to timber submitted tentatively include a classification of defects, also a tabulation of standard names of various types of structural timber. This committee announced that the A.S.T.M. rules for structural grades have been changed to conform to the "Basic Provisions for the Selection and Inspection of Softwood Dimensions and Timber Where Working Stresses Are Required" as recommended by the structural timber conference and approved by the central committee on lumber standards in December, 1928. A section on the calculation of working stresses and charts showing the relation between defects and strength have been added, but no changes have been made in the working stresses themselves. These rules will be published by the society at a later date.

Considerable work on the rapid field determination of moisture content of lumber has been done during the year, the most important development being the appearance of the first commercial instrument designed to make such determinations electrically, the Tag-Heppenstall moisture meter.

Cement—Since our unofficial report last week on the proposed change of the portland cement specification, committee C-1 has issued a statement giving the substance of the revisions. These revisions were approved in a session of the committee for letter-ballot of the entire committee and, if thereby approved, for submission to the committee on standards with a view to their early promulgation as tentative standard.

The proposed revisions include: (1) changing the title of the present standard so as to cover "portland cements" instead of "portland cement"; (2) insertion of two sets of strength requirements in the standard, one for portland cement and the other for high-early-strength portland cement; (3) making the tensile strength requirements of the 1:3 standard mortar for portland cement 200 lb. at three days and 275 lb. at seven days, and for high-early-strength portland cement 275 lb. at 24 hours and 375 lb. at 72 hours; (4) making the 28-day test optional with the purchaser and when so desired the strengths not to be lower than those obtained in the seven-day or 72-hour test (for portland cement or high-early-strength portland cement, respectively); and (5) placing a limit of 2.5 per cent on the sulphuric anhydride allowed in the high-early-strength portland cement.

Elaborate Retaining Wall Tests in Connection With Power Development

THE Fifteen-Mile Falls lower development of the Grafton Power Company, a part of the New England Power Association, involves the construction of a retaining wall 160 ft. high. On account of the magnitude of this wall it was felt desirable to make some experimental check on the common theories of design, by means of apparatus of greater size and refinement than has heretofore been used, and at the suggestion of the New Hampshire Public Service Commission, represented by Dr. Charles Terzaghi as a soil expert on this development, the New England Power Association has arranged for an experimental investigation of the question at the Massachusetts Institute of Technology. For this purpose a permanent retaining wall laboratory has been constructed which, after the conclusion of the Fifteen-Mile Falls tests now under way, will be the property of the institute and will be available for further earth pressure experimentatioı

The test bin in this laboratory is 14x14 ft. in plan and has a front wall 7 ft. high mounted on and supported by a system of precise weighing scales. The entire structure of the bin was designed to be so rigid as to keep all deflections below 0.001 in., in order that the experimental values might not be affected by yielding of the walls. The scale-mounted front wall, however, is capable of controlled horizontal movement inward or outward. Tests will be made with various materials in the bin, those of the present series of tests being clean coarse sand and boulder clay; the sand will be tested in a loose and in a compacted state. Provision is made for maintaining in some tests partial or complete saturation, and gages are provided for determining the position of the saturation line in the saturation tests. A lining of cup grease has been used to eliminate the variable influence of wall friction on the tests, but the front wall is not coated, since a study of the effect of wall friction on the intensity of the pressure forms part of the investigation. The entire series of experiments, it is expected, will furnish authoritative information of a kind hitherto lacking in the engineering of structures required to resist earth pressures.

The investigation is under the supervision of Prof. C. M. Spofford, Dr. Charles Terzaghi being in direct charge of the work. The weighing scales were designed at M.I.T. under the direction of Prof. E. F. Miller, head of the mechanical engineering department. Laboratory tests of the materials used in the bin experiments are being carried on at the same time, principally to determine internal friction values.

Engineering Foundation Undertakes Research Work in Iron Alloys

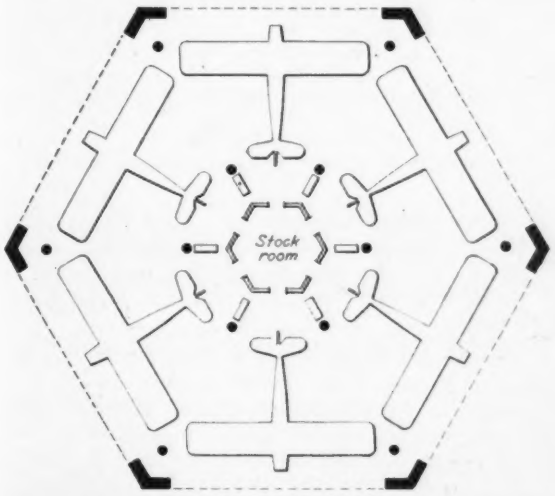
Research in alloys of iron, to keep America abreast of world progress in industry, is planned by the Engineering Foundation in co-operation with the American Institute of Mining and Metallurgical Engineers, it is announced at the national headquarters of the foundation. The industries, universities and technical schools, bureaus of the United States government, scientific organizations and foreign agencies will aid. The initial task is a critical five-year review of all available literature in English and other languages, resulting in a series of monographs and manuals, at a cost of $150,000.

From Job and Office

Hints That Cut Cost and Time for the Contractor and Engineer

Hexagonal Hangar With Six Doors Provides Quick Plane Exit

DEPARTING from the accepted type of rectangular hangar, the Western Air Express has built in Los Angeles a hexagonal hangar holding six planes, each of which faces out toward a door. The building, covering 54,000 sq.ft. of floor space, has a structural steel frame, concrete floor, and roof and sides of corrugated iron. Each of the six doors, 120 ft. wide by 20 ft. high and occupying almost the entire side, is operated by electric control. All the doors may be opened simultaneously within 30 seconds by means of a master switch. Planes are backed into position on a concrete floor that slopes slightly toward the doors, so that in case of fire they may be easily rolled out of the building.



HEXAGONAL HANGER CONSERVES STORAGE SPACE

The position of the planes in the hangar facilitates servicing from a circular stockroom in the center of the building, from the top of which the master mechanic may watch the work of the mechanics from a glass-inclosed office. The building was designed by W. Y. Eaves, of the Eaves Construction Company, and C. C. Cole, superintendent of operation for Western Air Express. A patent has been applied for on this design.

Home-Made Outfit Copies Field Notes Cheaply With Small Camera

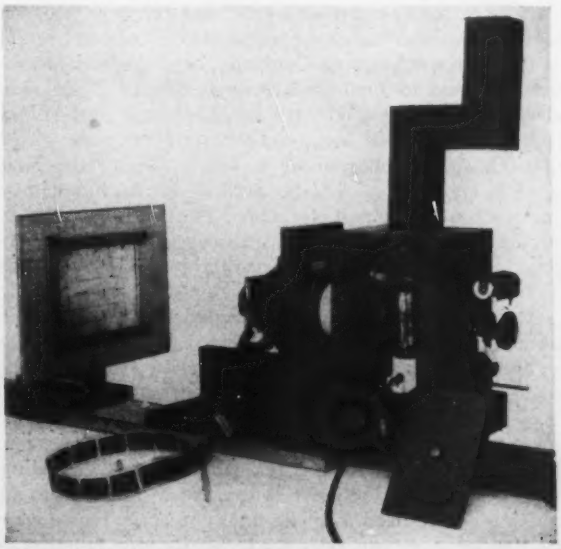
By Norton Meyer
Aldrich & Meyer, Civil Engineers
Los Angeles, Calif.

THE NEED for file copies of filed notes in cases where clients wished to retain the originals led to the development of a home-made outfit for photographing the pages on standard motion-picture film and reproducing them to normal size by printing enlargements on photostat paper. This method was found to make satisfactory copies quickly and economically, the cost varying from 4 to 8c. per sheet. The cost of hand-copying large numbers of field notes is prohibitive because of the time required in transcribing and comparing the copy to eliminate errors. Costs for hand-copied duplicates were found to run as high as 50c. per page. The use of commercial photostating was not entirely satisfactory because of the inconvenience of time required and the high unit cost for small quantities.

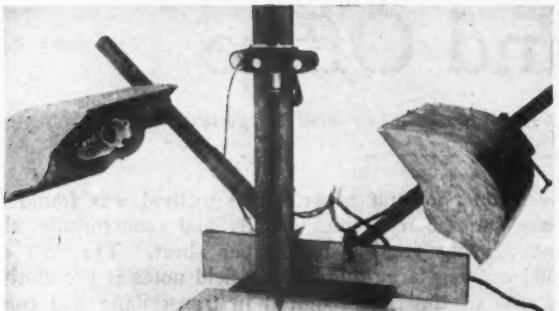
The improvised apparatus for photographing the pages of field notes or other records consists of a camera holding 5 ft. of movie film containing 36 exposures of approximately 1x1½ in. size (double standard movie frame). A clamp with ball-and-socket joint holds the camera to the upright, as shown in the accompanying picture, and the film and baseboard are made parallel by leveling with the small spirit level. A plumb bob suspended under the lens by a piece of bent wire and string is used to center the first sheet of the series to be copied. Once this adjustment is made, the plumb bob is removed and pages of similar size may be photographed with great rapidity. Illumination is furnished by two 500-watt stereopticon lamps with aluminum reflectors which enable the exposures to be made at snapshot speed and produce negatives of constant density.

A small dark room is required for developing the film and printing the reproductions. The 5 ft. of film is too long to handle by hand and a small drum frame is used to wind the film on while it is being immersed in the various solutions.

The printer, which is operated in the dark room, is shown in the accompanying picture. It consists essentially of a ventilated, light-proof lamp house containing a 200-watt stereopticon lamp with a pair of condensing lenses and a frame to hold the film. The switch shown



COPYING STAND FOR PHOTOGRAPHING FIELD NOTES



PRINTER FOR REPRODUCING FIELD NOTES ORIGINAL SIZE

at the back of the lamp house is a dimmer salvaged from an old radio "B" eliminator. The negative is projected on to sensitized paper held by grooved cleats on an easel which may be adjusted for focusing and changing the size of the print. The print paper used is regular photostat paper which is cheap, extremely rapid, and gives good contrast.

Because of the home-made character of the equipment, the initial cost of the plant was low, being between $20 and $30 for material exclusive of the camera.

One of the actual advantages developed through use of this apparatus is the possibility of quickly producing copies for the office draftsman. It oftens happens that certain information is needed by the field party and the office draftsman at the same time. In such cases the required pages of the notebook are photographed in a few minutes when the field party comes in at the end of the day, after which the notebook is available for field use again. Prints may be reproduced early the following morning and the notes made available for the draftsman.

Steel Arch Adjusted to Closure by 21-Part Tackle Tie-Backs

EXTENDING out over a gulch 400 ft. deep, the two halves of the Vance Creek steel-arch railroad bridge for the Simpson Logging Company, near Shelton, Wash., were adjusted to final closure by means of 2½-in. steel cable tie-backs provided with turnbuckles. This single-track bridge, 827 ft. long, consists of short plate girder approach spans followed by a 127-ft. deck truss span on each end and a 422-ft. arch span in the center. The depth of the gulch eliminated the use of falsework, and the erection of the arch was carried on almost entirely by means of a pair of cableways, one over each truss of the bridge.

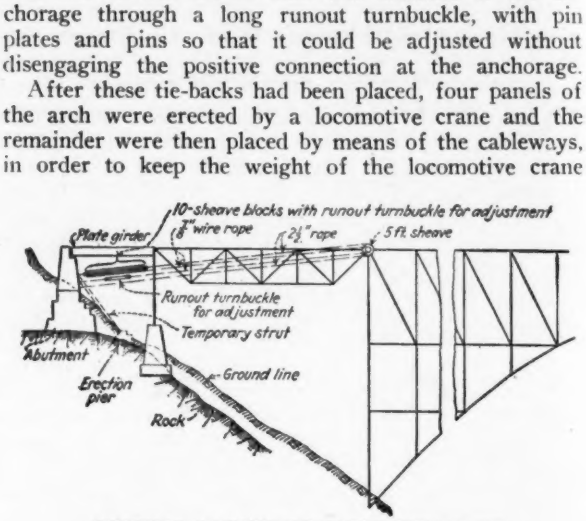
After the girder and truss approach spans were in position, cable tie-backs were placed before beginning the arch cantilevering. These tie-backs, one for each truss, shown in the accompanying drawing, consisted of 2½-in. cable running from the abutment to a 5-ft. sheave at the top of the first panel of the arched section. Passing through the sheave, the cable returned to within about 40 ft. of the abutment, where it was attached to an adjusting device used to make final closure. This device consisted of a set of falls made up of two ten-sheave wire-rope blocks and 21 parts of ⅞-in. wire rope. The

From Job and Office

Hints That Cut Cost and Time

lead line of this set of falls was attached to the anchorage through a long runout turnbuckle, with pin plates and pins so that it could be adjusted without disengaging the positive connection at the anchorage.

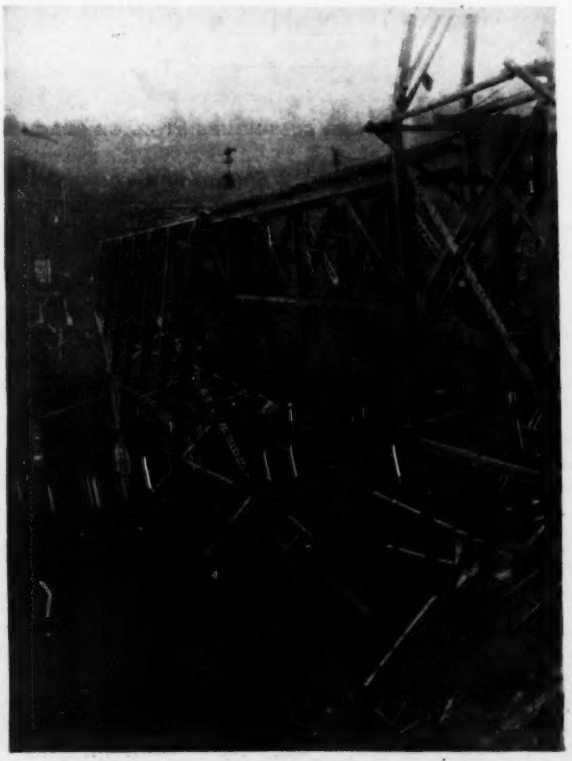
After these tie-backs had been placed, four panels of the arch were erected by a locomotive crane and the remainder were then placed by means of the cableways, in order to keep the weight of the locomotive crane



GENERAL LAYOUT OF CABLE TIE-BACKS

from overstressing the tie-backs. After the first half of the arch had been completed, the other half, across the gulch from the base of supplies, was erected by use of cableways and was provided with a similar system of tie-backs.

Temporary closure was designed to give a three-hinged



CABLE TIE-BACKS SUPPORT ARCH SPAN UNTIL FINAL ADJUSTMENT

From Job and Office

For Contractor and Engineer

arch by providing a pin at the intersection of the center panel diagonals. Semicircular bearings were provided at this point and the two halves of the arch were slacked down to this pin bearing by lengthening the tie-backs. Later, under proper temperature conditions the upper and lower chords of this center panel were drilled and riveted, making the completed structure a two-hinged arch.

Construction of the superstructure was carried out by the U. S. Steel Products Company, the steel being fabricated in the Trenton plant of the American Bridge Company. H. C. Hunter, division erecting manager, supervised construction. Sol Reed was in active charge of the railroad construction program for the Simpson Logging Company.

Titling Construction Photographs

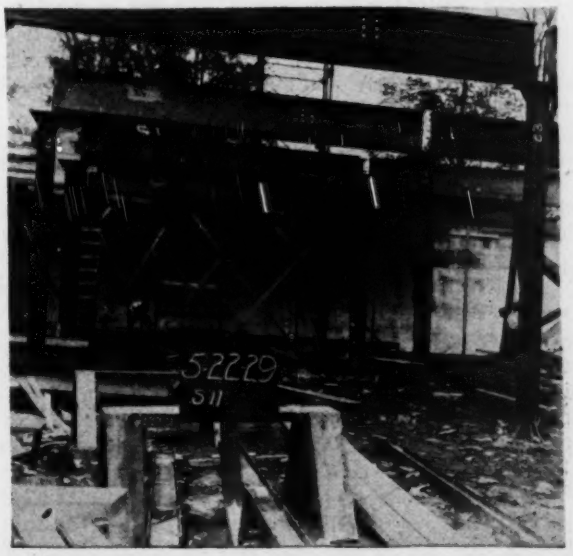
By J. A. Leonard
Bangor, Me.

PROBABLY no one in these days disputes the value of photographs of construction work, used either to display the progress of the work to distant directors or as a permanent record showing the methods used during construction.

The exact date upon which the photograph was taken is always of interest and sometimes becomes of great importance, but owing to the fact that ordinarily a considerable delay exists between the time the film is exposed and the time the finished photograph is received, much difficulty is experienced in assigning the exact date to each particular picture.

In order to remove this doubt, the writer uses a small blackboard, upon which is written with white chalk the date, the number of the negative and a symbol indicating the job. This blackboard is placed in the foreground, and when the negative is developed it automatically contains, without any chance of doubt or error, the date, number of the negative and name of job, which also of course appears without any further trouble upon the resulting print.

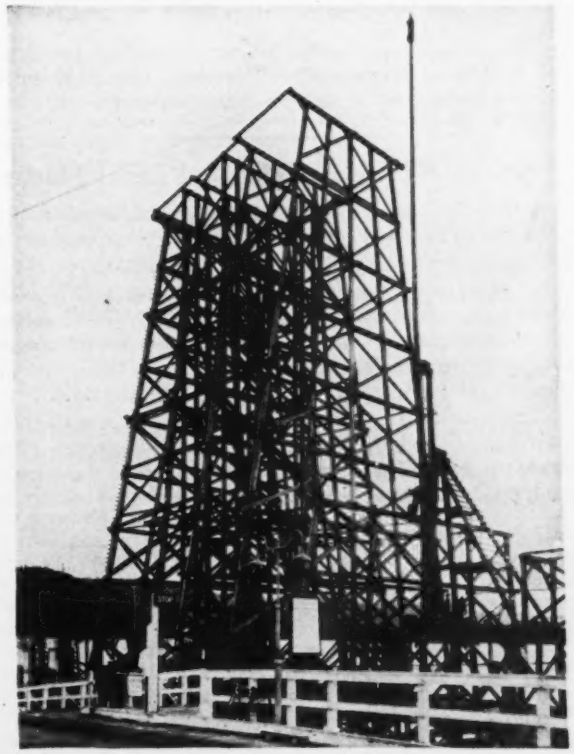
The accompanying illustration shows how distinctly the title appears.



METHOD OF TILTING PHOTOGRAPHS

High Bents for Trestle Approaches to Longview Bridge

IN THE construction of the vehicular toll bridge across the Columbia River between Rainier, Ore., and Longview, Wash., the firm erecting the steel desired to start with a platform suitable for supporting a derrick at bridge floor level, which is on the Washington end of the bridge, 151 ft. above mean lower low water. This was made possible by arrangement with the contractor building the trestle approach, who agreed to make a special set-up of the six bents of the approach trestle next to the bridge. By erecting these bents first instead of at the last of the approach construction job, as would have been the ordinary procedure, the six bents could be floored over immediately to support the derrick to be used in erecting steel. Accordingly, the bents were set up by the method shown in the accompanying illustration.



ERECTING TIMBER BENTS FOR LONGVIEW BRIDGE APPROACH
Note location of intermediate or false bents. The 130-ft. gin pole is lashed to piledriver leads.

Piles were driven for each bent and were capped at a level such that four five-post stories, each 30 ft. high, would bring the top of each bent to the prescribed grade. The stories were framed on the ground and, one at a time, were lifted to place by a gin pole lashed to the leads of a piledriver. The gin pole was 130 ft. long and was stayed with four guys at the top.

The bents were built up of 12x12-in. posts and caps;

the sway braces are 3x10's and the longitudinal bracing 6x8's. The cap on each bent was made 36 ft. long to provide for the 27-ft. roadway and two 3-ft. sidewalks with the usual bracing allowances. The spread of each bent at the base is 78 ft. Bents are spaced 20 ft. apart, except that between the first two pairs false bents were set for temporary service during the time that the steel-erection derrick is in use.

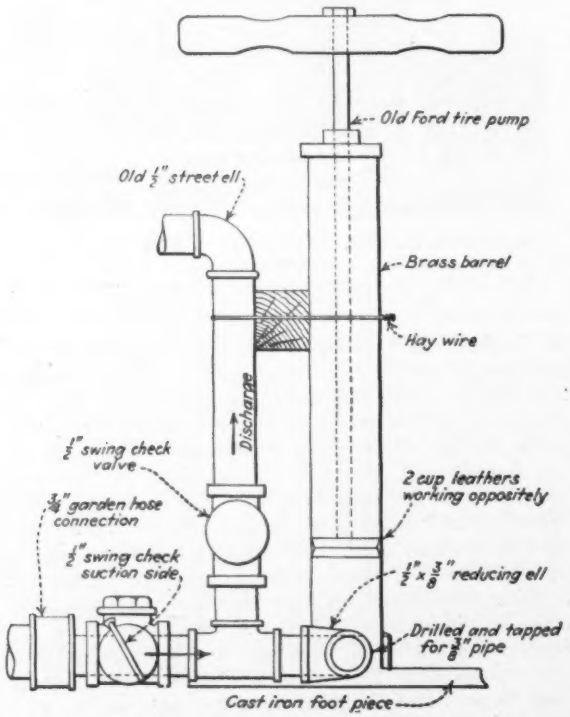
While these six bents were being erected, work on the remainder of the approach trestles was going on in the usual way, beginning at the shore end, to which the graded roadway afforded direct access. The timber approach on the Washington side will be 2,615 ft. long and on the Oregon side 1,792 ft. in length. At the bridge end of the approaches the maximum height of 151 ft. is attained on the Washington side, shown in the illustration; on the Oregon side the maximum trestle height will be only 100 ft.

Both timber approaches are being built by Lindstrom & Feigenson, contractors, Portland, Ore., for whom Henry Borghorst is superintendent on this work.

Sewage-Sludge Sampler and Level Finder

A SEWAGE-SLUDGE sampling and level finding pump, devised by H. L. Chesser, sewage-works operator of the City Engineering Department of Houston, Tex., is shown in the accompanying sketch. The device was made from old parts of fittings found around the warehouse. While it is crude, it is found considerably more simple and easier to handle than the old heavy-type pump or the bottle-and-cork method.

The apparatus consists of an old tire pump, with check valves and discharge pipe, and 25 ft. of garden hose, with markings 1 ft. apart, numbered from the suction end up. The hose is lowered into the tank with one hand while the pump is worked with the other. When the end of the hose touches the sludge, the operator can detect it immediately by the difference in the working of the pump. The sludge level is obtained by reading the marking on the hose.



SLUDGE SAMPLER AND LEVEL FINDER FOR IMHOFF TANKS
Sketch not drawn to scale.

Corrosive Action of Water Corrected by Hydrated Lime Treatment

By E. Sherman Chase
Metcalf & Eddy, Boston, Mass.

INVESTIGATION of the public water supply of Falmouth, Mass., with a view to eliminating discoloration, disclosed that the water, which is pumped from a natural pond, is very soft, highly corrosive and practically free from mineral constituents which, if present, would tend to deposit and form protective coatings on pipe interiors. It is also supersaturated with dissolved oxygen. This condition may have been due to changing temperature conditions, the presence of oxygen-producing organisms, or a combination of both. The water is low in alkalinity free carbon dioxide, iron and color. It is evident that the undesirable characteristics of the water as delivered to the consumers were due to changes taking place in the piping system and not to substances present in the water of the pond.

The distribution system includes about 96 miles of main with an estimated storage capacity of approximately 1 m.g., equivalent to about four days' consumption during the winter, as compared with one day's use during the summer. The greatest discoloration occurs during the winter, evidently due to the unusually long time of contact between the water and the pipe. Greater difficulty with unsatisfactory water was experienced in the outlying parts of the distribution system than in those sections close to the pumping stations. Cleaning the mains leading to one section of the town, instead of helping matters, somewhat increased the difficulty, probably due to the removal of partly protective accumulations and exposure of large areas of fairly clean iron surfaces.

Laboratory tests were carried on to determine the practicability of adding certain harmless mineral substances to the water to correct its corrosive qualities. Three substances were tried: soda ash, sodium silicate and calcium hydrate. Of these, calcium hydrate was by far the most efficient.

Hydrate of lime added in the proportion of 83 lb. per million gallons was found practically to overcome the corrosive action of the water. This addition of lime increased the hardness of the water about 10 p.p.m., which, in view of the very low natural hardness (3 p.p.m.) of the supply, was not of much importance.

As a result of the investigation it was recommended that the water commissioners install equipment for continuously adding hydrate of line to the water supply in the proportion of about 80 lb. per million gallons, varying the proportion from time to time as might be indicated by laboratory tests and by experience. At the present writing, the superintendent of the water-works, John C. Moore, is constructing the equipment required for the application of the lime. Actual operating experiences are not as yet available, but there is reason to believe that the use of lime at Falmouth will largely overcome the difficulties which have been experienced.

Letters to the Editor

Shortcomings of Engineers

Sir—Mr. Williams' article, "Making Engineers Effective," in your issue of May 9, p. 744, is indeed very interesting, as it shows plainly that all of us are puzzled with the engineering profession. In a general way we realize that engineers do not take an active part in life to the same extent as other professional men.

From personal knowledge I know that the main reason why engineers often progress slowly is the fact that they are not communicative enough to let people near them appreciate fully what they are able to do—that is, what they can achieve not only with their theoretical but also with their practical experience. Also, engineers in the first decade of their career try to be too accurate and precise. They have not come to the period when a man knows that in life there are certain customs that cannot be altered in a second. It takes time to change many things, because a certain consensus of opinion is necessary to change unwritten laws.

Great responsibility is thrown on engineers, and that is the main reason why they are so cautious in resolving problems of life. In other professions, those of lawyers and doctors, affairs are considered natural no matter how they are resolved. Engineering problems are supposed to be exact, and no leeway is permitted. Young engineers commencing life lose courage, and before long they are found in the pile of workers in the struggle for life.

I hope that more thoughts on engineering education will be published in your journal.

ETIENNE TOTTI,
Chief Engineer,
American Railroad Company.

San Juan, P. R.,
May 21, 1929.

Bridge Heights and the Mississippi

Sir—I should like to compliment you on the two editorials in your issue of June 13—namely, "Future Needs" and "The President's Problem." In my mind it is absolutely absurd to prohibit the building of the 57th St. Hudson River bridge, even at 175 ft. height. It is bad enough when, by War Department rulings, a train containing perhaps a thousand people can be delayed while a bargeload of brick goes through a draw.

As to the Mississippi flood control, the less this can be made a government job the better, as regards design, cost and time of completion. I think this point is emphasized by the stand which the Chief of Engineers has taken in the matter of the 57th St. Hudson River bridge.

A. H. WHITE,
Vice-President and Chief Engineer,
International Paper Company.

New York,
June 14, 1929.

Effect of Aggregates on Water Ratio of Concrete

Sir—The writer has been greatly interested in the series of articles by F. R. McMillan, "Basic Principles in Concrete Making," in view of the claims originally made for the water-cement ratio of proportioning concrete when it was proposed in 1919. That water content is one of the greatest factors affecting concrete strength has never been disputed. Critics of the theory, of whom the writer is one, have maintained that aggregate, its physical characteristics and quantity, is a secondary factor which must be considered along with water and cement content.

The water-cement ratio theory as originally stated included three important factors: (*a*) a water formula which it was claimed would furnish equal consistencies for concretes of equal cement content when combined with different aggregates having the same fineness modulus, (*b*) the use of fineness modulus as a criterion for the relative quantity of fine and coarse aggregate, or the grading of the mix, and (*c*) the water-cement ratio strength curve. It is interesting to note that the water formula has been abandoned and that fineness modulus can be forgotten and in its place a method of trial mixtures can be employed. Of these three important features of the original theory only the water-cement ratio strength curve remains.

The writer will agree that the elimination of these first two features has resulted in a partial return to "simplicity of understanding and practice," but he further believes that all complexities and uncertainties will not have been eliminated until it is recognized that the water-cement ratio strength relation is only approximate and that disregard of the aggregate factor in the practical application of the theory may result in concretes inferior to those which may be produced with the same aggregate and cement content.

Since the introduction of the water-cement ratio theory the writer has studied its application to the production of concrete with aggregates of the gravel type varying rather widely in physical characteristics. As a result of these tests he believes that strength for any given water-cement ratio is dependent not alone upon the ratio but also upon the quality and characteristics of the aggregate as well as the characteristics of the cement. Disregard of the aggregate factor tends with many well-graded aggregates to result in a concrete of inferior compressive strength and low permeability as compared with one which might be produced with the same aggregate.

In his original discussion at the time the water-cement ratio proportioning theory was proposed the writer pointed out that, with w/c constant, tests seemed to show that strength decreased as aggregate volume increased, even though no allowance was made for the absorption of water by dry aggregate. Tests also seemed to indicate that different aggregates as well as different gradings of the same aggregate resulted in a group of w/c strength curves covering a rather broad band or zone rather than a single curve. These strength variations for any single w/c value were too great to be accounted for by errors or natural variations found in carefully controlled tests. Similar conclusions have been drawn by other investigators in papers presented to the American Concrete Institute in recent years. Any one having concrete testing facilities may verify the relation of decrease in strength with increase in aggregate volume by preparing mixtures of cement and standard Ottawa sand in the proportions 1-0, 1-½, 1-1 and 1-1½, using the same water ratio for all and determining compressive strength at 28 days. These mixtures will be plastic and workable, with an excess of cement paste over the void content of the sand.

When concretes are prepared in accordance with the fineness modulus method of combining fine and coarse aggregate, the writer has generally found the resultant combinations inferior in strength and watertightness to mixtures of the same aggregate higher in sand, all having the same cement content and consistency. The higher sanded combination requires more mixing water, with a consequent greater w/c value, but it is stronger. Disregard of fineness modulus and the use of trial mixtures of fine and coarse will likewise tend to result in selection of undersanded mixtures.

The writer finds that more fine aggregate in the mix resulting in a lower fineness modulus and requiring the use of a greater amount of water for the same consistency, generally will furnish a superior concrete within limits as outlined below. Acceptance of the water-cement ratio law as the single controlling factor necessarily requires the least mixing water for any given cement content and consistency.

As a substitute for fineness modulus or trial mixtures the writer would suggest the use of aggregate combinations or gradings which have the greatest weight per cubic foot. The relation between maximum compressive strength and maximum unit weight of aggregate was pointed out by the writer in the *Journal* of the Engineering Institute of Canada, May, 1921. No exceptions to the rule have been found to date. For sands ranging in fineness modulus from approximately 2.5 to 3.7 (surface area per 100 grams from 800 to 400 sq.in.) a 50-50 sand-gravel combination by weight has generally been found to result in greatest weight per cubic foot. Only a scale and a measuring box are required to determine this best aggregate combination.

Given a fine and a coarse aggregate, two steps are involved in the production of the most economical mix of a specified quality: (1) determination of the best sand-gravel ratio, and (2) the addition of enough cement to this aggregate combination to furnish the specified strength with that consistency or flowability which must be used. The writer recommends the following procedure:

Step No. 1—With available aggregates determine that combination of fine and coarse aggregates which will have the greatest weight per cubic foot. If there is great variation in specific gravity, determine the combination of lowest void content.

Step No. 2—With this best sand-gravel ratio prepare concretes with three proportions of cement to aggregate, each proportion to be represented by two or preferably three consistencies. These mixtures should cover the range of strengths and consistencies which will be needed in practice.

Step No. 3—Guided by the results of step 2, specify volume or weight proportions of cement, fine and coarse aggregate as well as maximum permissible slumps or flows for the different qualities of concrete required. Modify mix if necessary as results of field tests become available.

Of the above recommended steps, No. 1 can be applied to all work whether large or small. Step No. 2 involves advance tests only with new or previously unused materials. In localities where materials of similar characteristics are used year after year, mixtures for any given strength and consistency will become established. When time does not permit the completion of step No. 2 before work is started, determine the water ratio for the specified strength as given by the water-cement ratio strength curve and by trial find the volume of the aggregate mixture which can be added to the paste, then specify proportions as before, correcting mix if necessary as tests are available. On large work or when unusual aggregates are available the selection of the aggregate grading in step No. 1 should also be verified by actual strength tests.

G. M. WILLIAMS,
Professor of Civil Engineering.
University of Saskatchewan.

Saskatoon, Sask.,
June 1, 1929.

* * *

Sir—The writer finds it difficult to reply properly to Professor Williams' discussion of the articles "Basic Principles of Concrete Making," for a good part of his comments is in reference to matters with which the articles were not concerned and much of the rest is in close agreement with the text of the article, though he seems to have missed this point. Perhaps his frank admission that he is a critic of the water-ratio theory explains his digression from the text and his failure to note wherein it agrees with his own ideas.

The principal point of difference seems to be the limits within which the water-cement ratio law of strength applies. Perhaps his data show a wider range than those quoted in the articles. But many of the published data purporting to show a similar discrepancy are in surprising agreement with those quoted when non-workability and water separation are taken into account. These matters were thoroughly treated in my articles and need not be elaborated here. The test suggested for checking the water-cement ratio law using standard Ottawa sand will likely prove misleading, for with a material of only one size of particle it is almost impossible to get workable mixes with different aggregate quantities and the same water ratio. At one end of the range the mixes are dry and non-plastic, at the other the water separates badly.

Professor Williams expresses the opinion that the use of the trial method of proportioning is likely to result in undersanded mixes. This is probably not the case; certainly undersanded mixes are not advocated in the articles. Apparently he did not read that section of the series in which the use of aggregate combinations of greatest unit weight was suggested. It is of interest to note also that his method of getting a job curve is the same as that given in the articles, except that he will later use the information in terms of mixes instead of in terms of water ratio. This, of course, involves very accurate control of consistency, grading and mix to obtain constant strength. If the results of these job tests are kept in terms of water-cement ratio, the information can be much more widely applied and will not require exact control of grading, mix or consistency to maintain uniformity.

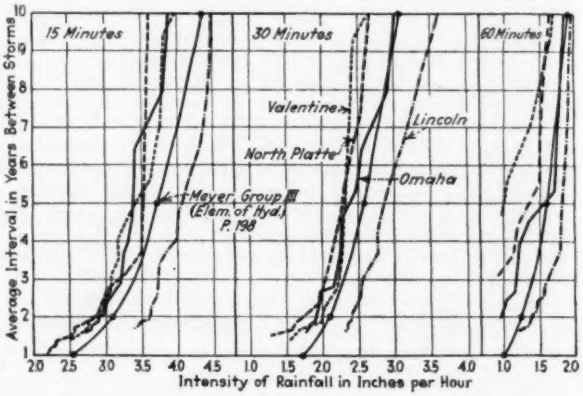
F. R. MCMILLAN.

Chicago, Ill., June 16, 1929.

Analyzing Records of Intense Rainfall

Sir—Studies of intense rainfall are always interesting and instructive. In your issue of May 23, 1929, F. M. Veatch presents the results of a comprehensive analysis of intense rainfall at four Nebraska Weather Bureau stations. The writer has long contended that until at least several hundred years' records are available for each station, the combined records from several stations treated as a single long-term record afford a better basis for conclusions regarding the frequency of intense rainfall than the records of individual stations considered by themselves.

Does anyone seriously contend that 1.5 in. of rain may be expected in 60 minutes, on an average, once in 2.5 years at



Lincoln, Neb.; once in five years at Omaha; once in 6.5 years at North Platte; and only once in 8 years at Valentine? The writer believes that these differences are purely accidental and will not be repeated. If so, they should be disregarded. Similar discrepencies appear in other rates.

Furthermore, Mr. Veatch appears to have used a method of analyzing these storms which the writer has repeatedly characterized as unwarranted and on the side of danger. In most practical applications of rainfall records the engineer is concerned with the *volume of water* which must be handled. Irregularities in the *rate* of rainfall over a given interval of time are usually wiped out by physical differences in the routes over which water travels toward the point of concentration under consideration. If a large amount of rain falls for fifteen minutes and the storm then stops, it is usually correct for purposes of design to assume that the same amount of water might also have fallen in twenty minutes, or even thirty minutes. When the average rate for the longer time interval is no longer excessive, the storm should receive no further consideration, but not before.

Mr. Veatch's Fig. 1 shows that in the 30th storm at Lincoln, rain fell for 40 minutes at the average rate of 1.5 in. per hour. This corresponds to an average rate of 0.75 in. per hour for 80 minutes. Yet the same Fig. 1 shows a rate of only about 0.8 in. per hour for the seventeenth storm and no rates whatsoever in any storm beyond the seventeenth. Similarly, Fig. 1 shows that in the fifteenth storm at Lincoln rain fell for 60 minutes at the average rate of 1.4 in. per hour. This is equivalent to over 1 in. per hour for 80 minutes, yet the same Fig. 1 shows no rate at all above 1 in. per hour beyond the fourteenth storm.

On the accompanying diagram, which is Mr. Veatch's Fig. 3 reproduced, the writer has plotted points according to his formulas presented on p. 198 of "Elements of Hydrology" for the territory included in his Group III. He believes that the smooth curves drawn through these points constitute a better basis for designing storm sewers at Grand Island, Neb., than the records of the individual stations shown by Mr. Veatch.

ADOLPH F. MEYER,
Consulting Hydraulic Engineer.

Minneapolis, Minn.,
June 5, 1929.

News of the Week

Polluted Well Causes Typhoid at Winston, Mo.

A serious epidemic of typhoid fever, due to sewage contamination of a well at a public school at Winston, Mo., is reported in the June bulletin of the state Board of Health of Missouri. All the cases occurred among the school children and teachers. The report says in part:

Few water-borne epidemics of typhoid fever have claimed as large a percentage of the persons using a contaminated water supply as the epidemic now raging at Winston, Mo.; 73 of the 178 pupils and teachers of the school have been stricken with the disease. Three children have died up to June 30 and, on the basis of the usual mortality from typhoid fever, several more deaths are to be expected. The consolidated school is within the city limits and obtains its water supply from a tile-lined well in the basement. The water level of the well is about 4 ft. below the floor of the basement and about 7 ft. below the level of the sewer draining the toilets. An inspection showed evidences of seepage into the well through cracks in the basement wall near the sewer. Fluorescein was placed in the toilets and 72 hours later the water in the well was colored with the dye, thus demonstrating the close connection between the sewer system and the well.

When the state Board of Health took up the matter, a sign was distributed directing that all water and milk for human consumption should be boiled. All the fever cases in the city and the school district were located and the families instructed as to precautions necessary to prevent further spread of the disease. A sanitary survey was made under the supervision of the board and the City Council agreed to correct unsanitary conditions.

Price Fixed for San Francisco Electric Systems

Decision has been rendered by the California Railroad Commission fixing the price to be paid by San Francisco for the electric systems of the Great Western Power Company and the Pacific Gas & Electric Company within the city, as they existed on Feb. 11, 1924, at $11,815,000 and $26,685,000 respectively. The Great Western Company had valued its property plus severance damages at approximately $30,000,000, and the Pacific Gas & Electric Company had valued its holdings and damage at $60,000,000, while the city had set figures at $9,000,000 and $19,000,000.

Both companies have expressed their intention of asking the commission for a re-hearing, and if that is denied, of appealing to the Supreme Court of the state for a writ of review.

Regional Meetings to Be Emphasized by Civil Engineers

Next Annual Convention to Be Handled as Sectional Undertaking—Board Acts on Professional Charges

Telegraphic staff report

PLANS to make a region rather than a city host to the society developed at the local sections' conference of the American Society of Civil Engineers held at Milwaukee July 9 before the formal opening of the society's 59th annual convention. Next year's convention is to be at Cleveland in July, with neighboring cities participating.

On Monday and Tuesday the board of direction met, with twenty of the twenty-five directors present. The board authorized the formation of a committee on engineering education, to cooperate with similar committees; other societies are looking toward a joint program. Plans for a summer school for civil engineering teachers at Yale in 1930 by the S.P.E.E. were indorsed.

Developments in the functions of the technical divisions were reported by the committee on technical procedure. The board authorized plans to keep members informed promptly of the work of technical division committees. It also authorized election of chairmen for two-year terms and re-election, to stabilize activities. A report on publications provides for more efficient sue of *Proceedings* and more systematic coverage of civil engineering subjects. Recommendations that the society accept funds from outside sources to aid in publication of voluminous papers were approved. Several alleged cases of unprofessional conduct were considered, and a report on charges for professional services was ordered printed for discussion before adoption. Applications for membership and transfer were acted upon in 117 cases.

Last Obstacle to Sacandaga Reservoir Removed

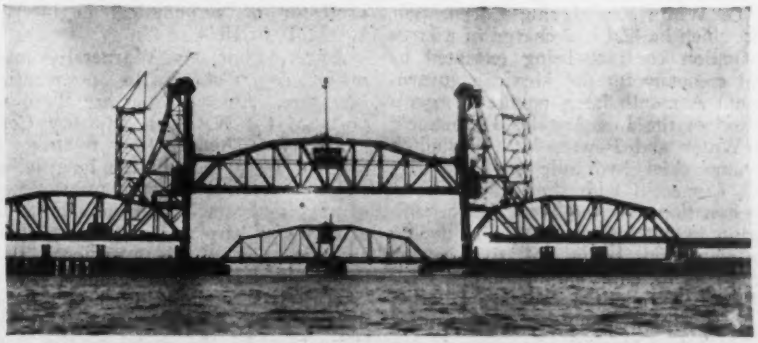
By the payment by the Hudson River Regulating Board to the Fonda, Johnstown & Gloversville Railroad of $1,727,696.55 on June 28, the last obstacle to the construction of the Sacandaga reservoir was overcome. The amount paid was the measure of damages awarded by the courts to the local railroad for the relocation of the railroad's tracks part of the way along the Sacandaga reservoir, as well as Northville terminals of the railway, and a portion of Sacandaga Park. The Sacandaga reservoir, now under construction, when completed will impound a body of water about the size of Lake George. It is a part of the $27,000,000 project which has for its object the regulation of the flow of the Hudson River.

Vertical Lift Span 322 Ft. Long Placed in Newark Bay Bridge

The 322-ft. double-track vertical lift span for the combined Pennsylvania-Lehigh Valley Railroad bridge under construction across Newark Bay was successfully floated into place on scows on July 8 and raised to a clear height to pass navigation. The span, weighing nearly 1,600 tons, was erected on falsework adjacent to the bridge site. During a high wind on April 1 the falsework collapsed, throwing the almost completed span into 24 ft. of water. It was recovered on June 24 by an elaborate jacking process and held suspended from new falsework until ready for floating to place.

The lift span, towers and part of the plate girder spans composing the bridge were fabricated and erected by the Bethelehem Steel Company.

A more complete description of the jacking methods used to recover the lift span from the bay and details of floating the span into place will appear in an early issue.



322-FT. LIFT SPAN ON NEWARK BAY BRIDGE RISING TO A CLEAR HEIGHT AFTER BEING FLOATED INTO PLACE FROM ERECTION FALSEWORK

Creation of Greater Pittsburgh Loses in Special Election

The creation of the metropolitan city of Pittsburgh, the boundaries of which were to overlie the present boundaries of Allegheny County, was defeated at the special election held June 25. Within this area there are 123 municipalities consisting of four cities, Pittsburgh, McKeesport, Clairton and Duquesne; 66 boroughs and 53 townships. The amendment to the Constitution of the Commonwealth of Pennsylvania which authorized the proposed change specified two requirements for its adoption: first, a majority of the total vote cast; second, a two-thirds majority in each of at least 62 municipalities (that is, a two-thirds favorable vote in a majority of the municipalities.) The first requirement was met, but only 49 of the municipalities approved the charter as follows:

RESULTS WITH RESPECT TO TOTAL VOTE CAST

	Yes	No
Pittsburgh	50,402	6,976
McKeesport	548	7,121
Duquesne	627	754
Clairton	538	715
66 boroughs	25,122	15,705
53 townships	10,570	9,702
	87,807	40,973

RESULTS IN RESPECT TO MUNICIPAL UNITS
(Two-thirds vote required to carry each municipality)

	Carried	Lost
Cities	1	3
Boroughs	34	32
Townships	15	38
	50	73

A detailed summary of the charter for the proposed metropolitan city was given in *Engineering News-Record*, March 28, 1929, p. 496.

Weymouth Made Chief Engineer of Colorado River Aqueduct

Frank E. Weymouth, chief hydraulic engineer for the Los Angeles Department of Water and Power, has been named chief engineer for the Metropolitan Water District in charge of construction of the Colorado River aqueduct. He will divide his time between the duties of the two offices.

Mr. Weymouth entered the employ of the city of Los Angeles in March of this year as assistant chief engineer of the Los Angeles Bureau of Water Works and Supply, resigning from the J. G. White Engineering Corporation, for which he had had charge of a large irrigation contract being executed by that company for the Mexican government. A month later, on the reorganization of the Los Angeles Department of Water and Power, Mr. Weymouth became chief hydraulic engineer. He was connected with the United States Reclamation Service from its organization in 1902 until 1924, and during the last four years of that period served as its chief engineer.

The Metropolitan Water District, consisting of a number of communities in southern California, was formed for the purpose of bringing a domestic water supply from the Colorado River.

Edward P. Warner Made Editor of "Aviation"

Edward P. Warner, president of the Society of Automotive Engineers, formerly Assistant Secretary of the Navy for Aeronautics and professor of aeronautical engineering in the Massachusetts Institute of Technology, has been made editor of *Aviation*, the oldest weekly in America devoted to aviation, published by the McGraw-Hill company. Mr. Warner in addition to his duties as editor will serve as aviation adviser to the company's 26 engineering industrial and business publications.

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Edward P. Warner

Mr. Warner has had a long career in the aeronautical industry. His interest as a student of aviation dates from 1910, when he constructed a glider that subsequently took a prize in the first intercollegiate and interscholastic glider meet at the Squantum aviation field near Boston in the spring of 1911. His active participation in the industry began at a time of the entry of the United States into the World War. He was the first Assistant Secretary of the Navy for Aeronautics. He became professor of aeronautical engineering at M.I.T. in 1924.

As an author, Mr. Warner has made many contributions to aeronautical literature. Among these are three reports of the National Advisory Committee for Aeronautics relating to original researches in the longitudinal stability of airplanes, the measurement of angles of attack, and the solution of problems of airplane wing truss stress analysis. Out of his experience as a teacher have come two volumes, one on "Aerostatics" and the other on "Aerodynamics of Airplane Design." The latter received the medal of the Aero Club of France for the best technical aeronautical work published in 1927 in any language. He assisted in the preparation of the early issues of *Aviation* and has been a contributor to the magazine throughout its life. Through the Society of Automotive Engineers he presented a story of the development of simplified formulas for airplane performance prediction, and another communication on the design of commercial airplanes.

In addition to his work in the Navy Department and the Massachusetts Institute of Technology, Mr. Warner has served as chief physicist for the National Advisory Committee for Aeronautics, and was technical editor for that body in Europe in 1920. In Massachusetts he served as chairman of the Massachusetts State Board of Aeronautics and of the Boston Municipal Air Board.

He has also been active in engineering societies. He has served as second vice-president and first vice-president of the Society of Automotive Engineers and is now president of that society. He was also chairman for one year of the aeronautical division of the American Society of Mechanical Engineers.

Earl D. Osborn, former publisher and editor of *Aviation*, will continue his relationship with the magazine as contributing editor. He will travel in Europe this summer and will report for the magazine his observations of progress and activities in the field of aeronautics abroad.

American Firm Gets Big Road Contract in Russia

Construction contracts totaling $150,000,000, in part fulfillment of the road development program recently undertaken by the government of Soviet Russia, have been awarded to the C. F. Seabrook Company of New York City.

The contracts will be spread over six years, and call for construction of 10,000 miles of roads in the Province of Moscow. Prof. H. E. Breed, consulting engineer and assistant professor of highway engineering at New York University, has sailed for Russia accompanied by A. W. Perlstrus, engineer of the Seabrook company, to make preliminary surveys. It is expected that construction work will begin next spring. A large number of American engineers will be employed.

While the materials and labor will be Russian, several million dollars will be spent in this country for equipment. Rollers, graders, steam shovels and the necessary equipment of the rock-crushing and cement-making plants will be purchased in America. It is said arrangements for financing these purchases have already been made.

The program on which Russia has embarked calls for the eventual expenditure of $38,000,000,000.

Other contracts that have been signed by the Russian government with American firms were announced in *Engineering News-Record*, June 13, 1929, p. 967.

New Madrid Landowners Lose Point in Suit

United States District Judge Faris in St. Louis, Mo., June 27 held that the United States government will not have to deposit $15,000,000 with the clerk of the court to assure compensation to 70 landowners of southeastern Missouri for losses to their property that will be occasioned by the construction of the War Department's setback levee between Bird's Point and New Madrid, Mo. The landowners in their suits contended that the government engineers contemplate paying them but $3,000,000 for their lands and other property that will be destroyed by the new levee system.

The government has filed condemnation suits to obtain the land needed for the levee right-of-way, but landowners contend that no provision has been made to compensate them for flowage rights through the land between the new levee and the old levee near the present course of the river.

High-Voltage Submarine Cables Planned

Two submarine cables to carry 11-kv. lines will soon be laid by the Southern California Edison Company to serve the new assembly plant of the Ford Motor Company at Long Beach, Calif. Permission to lay the cables has been already granted by the U. S. War Department. They will extend across the 6,000-ft. channel, and will be 37 ft. below low water line to insure clearance for vessels.

First Cable Connects Towers of Hudson River Bridge

Stringing the first cable of the Hudson River bridge connecting New York City with Fort Lee, N. J., was accomplished without untoward incident July 9. After having been laid down on the river bottom from a barge, the cable was raised by cranes at the tops of the two towers. It is the first of two groups of nine 2-in. cables which will support each of the two foot-bridges from which the work of spinning the four 36-in. main cables will be conducted.

Work to Begin at Once on N. Y. Triborough Bridge

The New York City Board of Estimate on June 27 authorized the immediate issuance of $3,000,000 corporate stock to enable the Department of Plant and Structures to proceed with the construction of the Triborough bridge, which will connect the boroughs of Queens, Manhattan and the Bronx. Commissioner Goldman announces that he will proceed at once with the foundations in the three boroughs and on Randall's and Ward islands and that by September the plans for the superstructure should be ready for adoption.

A perspective drawing of the proposed bridge appeared in *Engineering News-Record*, March 31, 1927, p. 542.

DUMPING ROCK INTO SALT SPRINGS DAM

Three million cubic yards of granite rock will be required to form the Salt Springs rockfill dam being built by the Pacific Gas & Electric Company on the Mokelumne River in California to store 130,000 acre-ft. of water for power development. With a height of 330 ft. and a crest 1,300 ft. long, this dam will be faced with reinforced concrete 3 ft. thick at the bottom and 1.5 ft. thick at the top, backed by a layer of derrick-placed rock 15 ft. thick. The construction program calls for completion during 1931.

Landslides Threaten Residences Near San Pedro, Calif.

Cracking pavements and broken water mains among the few residences along the top of the ocean cliff at Point Fermin, San Pedro, Calif., during the past few months have indicated the gradual subsidence of a 5-acre area toward the beach. This area, semi-circular in shape, has moved a maximum distance of 8 in. seaward and settled 2½ in. as measured along street paving in the affected section.

A geological report on the causes of the movement by Dr. F. L. Ransome dated May 7 states that the area is underlain with interbedded shales and sandstones dipping toward the ocean, observations indicating clearly that the movement is a landslide in its early stages. Probable causes include the character of the shale, possible earlier faulting, prevailing dips toward the ocean and the presence of moisture in the strata. The disturbance seems to be due to the resumption of an old slide, and indications are that movement is likely to continue at a slow rate. The report recommends that for the present further movement be checked carefully by surveys, that open cracks be filled immediately as a protection from the inflow of surface water and a system of drains be installed to remove water which otherwise would tend to sink into the disturbed mass and act as a lubricant. It was further recommended that large permanent buildings should not be constructed on the affected area and that, in order to assure stoppage of construction, conversion of this land into a public park be considered. A resolution asking that the city start eminent domain proceedings at once has been introduced into the City Council.

Lac Seul Storage Dam Completed

L. V. Rorke, Deputy Minister of Lands and Forests for Ontario, has officially declared completed the Lac Seul storage dam constructed jointly by the Ontario, Dominion and Manitoba governments on the English River at the outlet to Lac Seul. The dam, of concrete, is 600 ft. long and 48 ft. high. It consists of twenty sluices, each 14 ft. wide, with an earth embankment 600 ft. long, and provides a 12-ft. range on Lac Seul and Lost Lake.

The power house is located immediately below the dam, and the installation will comprise one 5,000-hp. and two 10,000-hp. turbines. The initial delivery of 5,000 hp. will be made to the Howey mines over a 45-mile transmission line, and the ultimate supply will be available for other mines in the Patricia district.

The transportation of materials for the power house has been greatly aided by the construction last fall of the marine railways to overcome the difficulties presented by the rapids, and the cost of haulage has been so greatly reduced that application has been made to the government for the construction of other marine railways in the district.

Seattle City Council Authorizes $13,500,000 Bond Issue

Under an ordinance passed by the Seattle City Council authorizing a bond issue of $13,500,000, all of the features of a five-year development program for the City Light Department on the Skagit River, inside the city and at Cedar Falls on the Cedar River, now are provided for. The building of a new power house at Diablo, to cost about $2,500,000, is one of the important parts of the program covered by the bond issue.

Brief News

OFFICIALS of the U. S. Bureau of Public Roads and the chief engineers of the highway departments of Wyoming, Colorado, Montana and New Mexico met in Cheyenne, Wyo., recently to discuss uniform methods to be used in making a proposed traffic count which would be of value in determining future road construction.

CREATION of the Miami Airport and Harbor District is provided for in a bill which has recently passed the legislature of Florida. A commission will be elected to make an investigation of port and terminal conditions in Dade County and to prepare a comprehensive plan for the development of port and terminal facilities, including airports, in that district.

DESIGNS FOR A NEW BUILDING to cost $9,740,000 for the U. S. Supreme Court have been submitted to the House of Representatives by David Lynn, executive officer of the Supreme Court Building Commission. The site for the building is between Second St., East Capital St., First St. and Maryland Ave.

BIDS WILL BE OPENED on July 17 by the Detroit Department of Public Works for the construction of a main hangar for the Detroit city airport. The hangar will have 200,000 sq.ft. of floor space and its cost is estimated at $1,000,000.

THE DELAWARE RIVER BRIDGE, during its third year, ended June 30, handled 10,688,820 vehicles, an increase over the year preceding of 1,581,141. At the same time the span broke all previous monthly records by handling 1,126,167 vehicles during June.

CONTRACTS WERE SIGNED on July 5 between New York City and the New York Central Railroad which assure the West Side improvement, whereby the railroad tracks will be removed from the city streets, where they now run at grade. The improvement will cost $150,000,000 and will be completed in six years.

A LARGE STORAGE RESERVOIR near St. Michel des Saints, on the Mattawin River, a tributary of the St. Maurice, will be built by the Shawinigan Water & Power Company at a cost of about $4,000,000. Completion of the reservoir, which is planned for 1930, will make possible a better use of the reservoirs in the Upper St. Maurice, and the company is now planning for one additional unit in each of its three projected plants on the Upper St. Maurice.

A TEST SUIT brought by Mrs. Annette O. Shearer against the federal government for $7,500 damages for the death of her husband, C. E. Shearer, in the sinking of the steamer "M. E. Norman" near Memphis, Tenn., May 8, 1925, has resulted in a jury award of the full amount asked. Twenty other similar suits are pending. It is believed that the government will appeal the case to a higher court.

ADOPTION of the city manager form of government was defeated at recent elections held in Terre Haute and Vincennes, Ind. The former rejected the measure by a vote of 8,382 to 7,253. At Vincennes 2,364 voted against the measure to 851 for it.

STEEL FRAMEWORK has been completed for the 53-story Lincoln Building in the Grand Central district of New York City. Dwight P. Robinson & Company, Inc., contractor, reports that approximately 17,000 tons of structural steel for the 680-ft. building were placed in four months.

AN IMPORTANT STEP in carrying out its program of expansion has been taken by the Ontario Hydro Electric Power Commission by the purchase of the Ottawa Valley power interests of M. J. O'Brien for a cash payment of $1,800,000. Properties purchased include four power sites, Claybank, Stewartville, Burnstown and High Falls, with an aggregate estimated capacity of 85,000 hp., all located on the Madawaska and Mississippi rivers, tributaries of the Ottawa River. Also included are the Calabogie and Galetta plants, developing 6,000 hp.

MUNICIPAL SPEED ORDINANCES in Ohio must conform to the state traffic act, according to a ruling handed down by the Ohio Supreme Court. The revised state law, which goes into effect July 21, sets the maximum speed at 25, 35 and 45 miles per hour in congested districts, residential sections and the open country.

ANNEXATION by Atlanta, Ga., of four parcels of land, comprising approximately 7 square miles and including more than 15,000 residents, was approved on June 21 in a special session of the City Council by a margin of three votes, but the measure was vetoed by the acting mayor.

THE POSITIONS of city engineer and superintendent of streets of Phoenix, Ariz., have been consolidated and the salary raised to $8,100. W. J. Jamieson is city engineer. The City Commission has created the office of deputy city engineer at a salary of $5,400.

AN 18,000-Kw. steam power plant will be built near Phoenix, Ariz., by the Central Arizona Light & Power Company under a contract with the Salt River Valley Water Users Association which has been approved by the Secretary of the Interior. The terms provide that the power company is to build and pay for the plant, but that all carrying charges and operating costs will be assumed by the water users' association until Nov. 1, 1932, for which it will receive the entire output. Upon that date the power company will assume one-third of the carrying charges and receive one-third of the output for three years, after which it will take over another third and, at the end of eight years, the complete plant.

THE COMMISSION-MANAGER form of government was rejected by the voters of Casper, Wyo., on June 26 by a vote of 2,731 to 963. Only about half of the electors voted.

THE CARGO TONNAGE passing through the Panama Canal from the Atlantic to the Pacific during the month of May amounted to 920,360 long tons, the largest amount in that direction in one month since the opening of the canal. The heaviest Pacific-bound tonnage in any previous month was in October, 1928, when 875,641 long tons were carried through.

WORK HAS BEEN STARTED on the $22,500,000 electrification program of the Pennsylvania Railroad through Baltimore. The project calls for the construction of additional terminal facilities in Baltimore, for underground track and underground power transmission. It is expected that the work will take five years.

APPLICATION has been made to the Interstate Commerce Commission by the Los Angeles & Salt Lake Railroad Company for authority to construct a branch line 22.6 miles long from a connection with the applicant's main line at a point 6.83 miles south of Las Vegas, Nev., from which terminus construction will be carried on by the United States government to the site of the proposed Boulder dam on the Colorado River. The necessity for the construction lies in the fact that no railroad serves the site of the proposed dam.

A BOND ELECTION at Fort Worth, Tex., on June 25 carried by a vote of six to one three items totaling $3,000,000. One item, of $2,000,000, was for subways and viaducts at railroad crossings and will facilitate the program of the Texas Pacific Railroad in its plans for a new passenger station and a freight terminal. The other items were $500,000 for the purchase of ground for a municipal airport and $500,000 for the site and erection of a new central fire station and enlargement of the fire alarm system.

A SANITARY SURVEY of the Royaltown (N. J.) watershed will be made by the Port Raritan District Commission of New Jersey, which has engaged the consulting engineering firm of Remington, Vosbury & Goff, of Cam-

den, N. J., for this purpose. Considerable work has already been done by the state to determine the degree to which the river is polluted by sewage, and the additional work is to determine the best means of eliminating this sewage. This will include the comparative cost of a trunk sewer, as against that of individual treatment of sewage by the various municipalities affected.

APPROPRIATIONS aggregating $3,937,000 for its 1929 construction and improvement program have been granted to the Westchester County (N. Y.) Park Commission. The two largest items are for the Cross-County Parkway, $1,327,000, and for the Saw Mill River Parkway and connections, $1,621,000.

GROUND WAS BROKEN on June 26 for the Grosse Isle-Amherstburg bridge over the Detroit River, another link between the United States and Canada. The bridge is to be of the cantilever type, with two main spans over the river channels. The cost is estimated at $2,000,000.

THE FLOOD-CONTROL PROGRAM proposed for Orange County, Calif., involving a total estimated cost of $16,500,000, was defeated by the voters at a special election held on June 25.

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

Interoceanic Canals—Flood Control and Forests—Study Plans for Boulder Dam Work

AS THE War Department is preparing to send out surveying parties in Nicaragua and in Panama in accordance with the Congressional act calling for a report on interoceanic canals, a difference of engineering opinion is developing as to the practicability of enlarging the Panama Canal. Although emphasis was placed by Congress on making a resurvey of the Nicaraguan Canal route, the army engineers were asked also to study any other practicable route and to determine upon the feasibility of converting the Panama Canal into a sea-level route.

Due to the small appropriation of $150,000 provided for the work, no extensive survey is contemplated at this time except in Nicaragua. Governor Burgess of the Panama Canal will be called upon to supply the part of the report relating to that section. Although the statement has been made by some of the army engineers that the Panama Canal can be enlarged into a sea-level route for an amount no greater than would be required to construct a canal across Nicaragua, Governor Burgess has taken issue with this proposal. In the first place, it is learned that the Governor is more conservative than some of the other engineer officers in estimating the increased tonnage that may be expected at Panama. By providing an additional set of locks, he believes that the canal traffic can be adequately accommodated for years to come.

The provision of a third set of locks would impose a serious tax on the water supply even with the completion of the Alhajuela dam, it is realized. To offset this, Governor Burgess proposes that a fourth set of smaller locks be provided. These, because of their smaller size, would use less water and could be employed as a substitute for the other locks for all vessels within their capacity.

As to the board of civilian engineers recently appointed by the President to supervise the surveys, it is the opinion of the Corps of Engineers that it will act in an advisory capacity only. The Congressional act calling for the report leaves the direction of the work in the hands of the War Department, it is stated. Because of this it is believed that while the recommendations of the board probably will be followed, they will not be binding. No early meeting of the Interoceanic Canal Board is in prospect. The voluminous report made in 1901 must be reviewed, as well as the extensive comment on the findings of that board. As the careful study made at that time resulted in the rejection of all of the nineteen proposed routes except Panama and Nicaragua, the expectation is that most of the work of the present board will be concentrated on the Nicaraguan route. The board probably will not go to Nicaragua until next winter, when most of the route will have been made accessible.

Forests as Flood Reducers

That the forests of the Mississippi drainage basin, under proper protection and care, will store immense quantities of rain water, reduce the rapidity of run-off and thus assist in reducing floods is shown by a detailed report on the relation of forestry to flood control issued by direction of the committee on flood control of the House of Representatives. The report, prepared by the Forest Service recommends strongly that the improvement of forest conditions throughout the basin should have a part in the flood prevention program as a necessary supplement to engineering works. The report was prepared under the direction of Associate Forester E. A. Sherman and was transmitted to Congress by the President in compliance with section 10 of the flood-control act of May 15, 1928, which called for further data on the relation of forestry practice to flood control. Representing a study of large proportions, the investigation includes detailed reports on every important drainage area in the entire Mississippi system.

What are described as "some startling facts" are brought to light in the report. It is shown that the forests of the Mississippi watershed, even in their present largely mismanaged condition, were responsible for a reduction in the possible flood crest of nearly 15 in. Were all the forests of the Mississippi drainage area protected and managed in accordance with established forestry principles, it is declared, a further reduction in possible flood crests of 55 in. would be possible. This restraining effect would be equivalent to the storage capacity of some 4.6 reservoirs each with a capacity of 10,000,000 acre-ft.

Contractors Oppose Limitation of Price Guarantees

The proposal to limit fixed price guarantees to 90 days after contracts are signed, which was discussed during a recent trade practice conference of metal lath manufacturers, has aroused the opposition of the Associated General Contractors. In outlining their position, the contractors point out that the fixed price guarantee is of fundamental importance to the construction industry, since the price of the commodities and services that must be incorporated into the structure must be known in advance. Should the Federal Trade Commission consent to an agreement by metal lath manufacturers to refrain from holding the price to the amount agreed upon in the contract for more than 90 days, a precedent will be established which will impose an increased burden on contractors, it is held. The point is made also that if the principle indorsed by the metal lath industry is approved, serious difficulty may be encountered in financing building operations, since most of this work is computed on the basis of costs provided in the contract.

Objections to other resolutions considered at the trade practice conference have been raised by the contractors. In this connection particular criticism is being directed against a proposal to create a permanent committee in the metal lath group which would be charged with examining and inspecting contractors, jobbers, dealers and jobbers to see that the resolutions adopted by the conference are being observed.

Boulder Dam Preliminaries

Work of constructing the branch railroad line to the Boulder dam site cannot be undertaken until a thorough survey has been made of the gravel deposits of the region between Las Vegas and the dam site. Gravel deposits exist throughout the territory, but it is essential to get the best possible quality. To insure this, engineers of the Reclamation Bureau are shipping 1-ton samples from a large number of deposits to Denver, where the Bureau of Standards is making careful tests and classifying the samples. The location of the railroad line cannot be determined until the source from which the gravel will come has been decided upon.

The chief counsel of the Federal Power Commission is studying the Colorado River situation with a view to the formulation of a formal opinion covering the status of the more than 30 projects on that river which have been held in abeyance pending the settlement of the Boulder Canyon question. Doubt exists as to whether the proclamation of the President, making effective the Boulder dam act, automatically raises the ban imposed by Congress upon all other Colorado River projects. Some are of the opinion that no action on Colorado River applications can be taken until the Secretary of the Interior has concluded contracts for the sale of the power.

Engineering Societies

CALENDAR

ANNUAL MEETINGS

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; annual convention, Milwaukee, Wis., July 10-12.

AMERICAN ASSOCIATION OF ENGINEERS, Chicago; annual meeting, Mexico City, Aug. 26-28.

* * *

THE PACIFIC COAST BUILDING OFFICIALS CONFERENCE will hold its eighth annual meeting in Portland, Ore., Sept. 3-6.

THE ENGINEERS' CLUB OF SAN DIEGO, CALIF., has been formed, with a membership of 80. Officers elected are: E. L. Freeland, president; R. Robinson Rowe, vice-president; R. E. Jensen, secretary; Ernest H. Smith, treasurer.

Personal Notes

E. W. PITTMAN, formerly of Pittsburgh, Pa., has been appointed chief engineer of the Petroleum Iron Works Company of Texas, with headquarters at Beaumont.

WILLIAM O. DOLLARHYDE, of Charleston, W. Va., who has recently been in private engineering practice, has been placed in charge of tunnel construction for the Nicholas, Fayette & Greenbriar Railroad, a subsidiary of the New York Central Railroad Company. Mr. Dollarhyde was recently with the Louisville & Nashville Railroad in charge of various railroad projects throughout the South.

ALBERT W. WATERMAN, recently chief of party on trunk sewer construction in Waterbury, Conn., has been appointed city engineer of South Portland, Me.

ROBERT WILLIAM BAILY, formerly district manager in Philadelphia for L. R. MacKenzie & Associates, Inc., has been elected president of the Baily-Davis Corporation, Philadelphia, Pa., which concern will specialize in street paving.

E. J. ROWLAND, resident engineer for the Minnesota Highway Department, has been promoted to assistant right-of-way engineer with headquarters in St. Paul.

S. BENT RUSSELL has opened an office as consulting engineer in St. Louis, Mo. He will specialize on municipal engineering, water-works, industrial buildings and machine design.

JAMES J. SLOYAN, of New York City, recently with the Phoenix Utility Company on the construction of the Clymer hydro-electric station at Easton, Pa., is now with the Pittsburgh-Des Moines Steel Company as superintendent of construction of water supply extension at the United States Naval Ammunition Depot, Iona Island, N. Y.

CHARLES F. GOOB, chief engineer of Baltimore, Md., is chairman of a civic committee in charge of arrangements for celebrating the two hundredth anniversary of Baltimore in September.

ARCHIE GREEN, formerly with the highway commissions of North Carolina and Arkansas, has accepted a position as bridge designer in Costa Rica for the James F. Martin Corporation.

CHRIS WRIGHT, formerly assistant to the district highway engineer at Pine Bluff, Ark., has been appointed city engineer of that city.

M. H. DOYNE has been appointed consulting engineer to the Department of Public Utilities of St. Louis, Mo., succeeding C. E. Smith, now vice-president of the New York, New Haven & Hartford Railroad.

WILLIAM K. HATT, head of the school of civil engineering of Purdue University, has been appointed chairman of the building code committee of the U. S. Department of Commerce.

FRANK G. BRECKMANN is now employed in the engineering department of the Standard Oil Company, and is located at Whiting, Ind.

ANDREW V. GREAVES, of Boston, Mass., has joined as hydraulic engineer the firm of Chase & Gilbert, Inc., of Boston. Previously Mr. Greaves was with Vaughan Engineers, of Boston.

W. D. CLARK, for seven years city engineer of Bakersfield, Calif., has been appointed city manager, suceeding James A. Ogden, who died May 29. JOSEPH B. HOLFELDER, assistant engineer, has been appointed city engineer.

WALTER COMBS, of Pine Bluff, Ark., has resigned as city engineer to accept a position with the Arkansas State Highway Department. Mr. Combs has been city engineer of Pine Bluff for seven months, succeeding Frank R. Allen.

WILLIAM STUDDERT has resigned from the Pennsylvania State Highway Department to accept a position in Costa Rica with the James F. Martin Corporation.

ERWIN DAMES, former city engineer at San Mateo, Calif., has been appointed city manager and city engineer of Pacific Grove, Calif. Mr. Dames has been engaged in various phases of municipal work since 1920 and was at one time superintendent of public works at Winnetka, Ill. He is a graduate of the University of Wisconsin.

O. LAURGAARD, city engineer of Portland, Ore., and IVAN E. OAKES, of Ontario, have been reappointed by Governor Patterson, of Oregon, as members of the state Board of Engineering Examiners. ROBERT M. BETTS, of Black Butte, Lane County, was appointed a member of the board to succeed Frank S. Baillie, formerly of Portland. The appointments are for six years.

C. R. YOUNG, professor of structural engineering in the University of Toronto, has been appointed professor of civil engineering in the same institution in succession to the late Prof. Peter Gillespie.

HOWARD L. MATHEWS, structural engineer, Richmond, Va., has accepted a position with the H. K. Furgeson Company, of Cleveland, Ohio. Previously Mr. Mathews was with the Chesapeake & Ohio Railroad in Richmond.

RUSSELL S. LYMAN, of Bryn Athyn, Pa., who formerly was engineer for the Joseph Banks Construction Company, of Wilkes-Barre, Pa., is now with the Pennsylvania Department of Highways as senior inspector. Previously Mr. Lyman was with the Juniata Construction Company, of Philadelphia.

GUSTAF E. BJORK, of Bound Brook, N. J., who has recently been in the design office of the American Smelting & Refining Company at El Paso, Tex., has joined the staff of the Research Corporation, New York, as field engineer for the construction of precipitators. Previously Mr. Bjork was with Sullivan Mining Company, Kellogg, Idaho, on the construction of its new electrolytic zinc plant.

Obituary

ADOLPHUS J. EDDY, city engineer of Berkeley, Calif., died in San Francisco June 28. After his graduation from the University of California, he remained at that institution as a member of the faculty in the engineering department and later became a structural engineer for the Standard Oil Company of California, leaving to enter the municipal service of Berkeley. He was an associate member of the American Society of Civil Engineers.

ALEXANDER HAMILTON TWOMBLY, of Summit, N. J., died on June 26. After his graduation from the Massachusetts Institute of Technology, Mr. Twombly became connected with S. D. Warren & Company, in charge of that concern's water power at Gardiner, Me. Later Mr. Twombly came to New York City, where he was employed by the engineering firm of Westinghouse, Church, Kerr & Company, and subsequently constructed the sewerage systems of Boca Grande and Tampa, Fla., and later built, for the government, Camp Shelby in Hattiesburg, Miss. After the war he was employed as engineer-in-chief in the erection of the plant of the St. Louis Coke & Chemical Company, of St. Louis, Mo., of which company he became president.

Construction Equipment and Materials

Federal Trade Commission Aids Construction Industry

Two construction materials industries, lime and metal lath, recently held trade practice conferences in Washington, D. C., under Federal Trade Commission auspices. About three-quarters of the American production of both products was represented by the delegates in attendance. Each industry passed a series of resolutions aimed at unfair methods such as misbranding, misrepresentation, defamation of competitors and practices more specifically related to the commodities in question. These rules are now before the commission for final approval.

The commission has authorized the holding of a trade practice conference for the concrete mixer and paver industry, following a request submitted by about 95 per cent of the manufacturers of this type of equipment.

Leipzig Fair Opens Aug. 25

An attendance of approximately 180,000 exhibitors and buyers from all parts of the world is expected at the Leipzig Trade Fair, to be held in Europe Aug. 25-31. American participation in this exposition is steadily increasing, it being stated that the spring fair of this year was attended by more than 3,000 buyers from all sections of the United States, which also sent more than 100 exhibits of its products.

Committee to Encourage Use of Reinforced Concrete

A nation-wide movement to increase the market for reinforced-concrete construction has been inaugurated by the Concrete Reinforcing Steel Institute with the co-operation of the Portland Cement Association. The executive committee of the institute has approved the creation of a market extension committee which will have representation in all leading cities of the country. This will consist of a general chairman and five district chairmen, who will, in turn, form local committees in the key cities of the country. The local committees are to list every forthcoming project in their territory where reinforced concrete can be used and are to make every possible effort to influence its selection. The local committees are to report monthly to their district chairman, who will report to the general chairman, George E. Routh, Jr., of the Kalman Steel Company, Chicago, Ill.

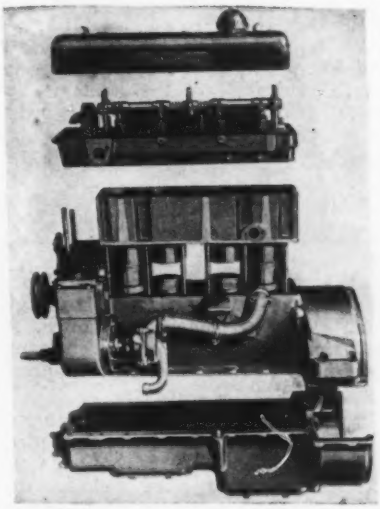
In addition to the activities outlined, the market extension committee will try to secure general adoption of the joint building codes.

New Developments

Easy Maintenance a Feature of Heavy-Duty Motor Truck

A new line of heavy-duty motor trucks with rating of 2½, 3½ and 5 tons has been developed by the International Harvester Company, Chicago, Ill. These are being made in both the chain-drive and double-reduction types with the exception of the 5-ton size, which is of chain-drive type only. Equipment includes four-wheel brakes, single dry-plate clutches with vibration dampers and transmissions with five forward and two reverse speeds. The low gear reduction is approximately 100 to 1.

One of the unusual features of the new trucks is that each engine consists of five independently maintained subassemblies, an arrangement which simplifies servicing and thus helps to keep the truck on the job. The overhead

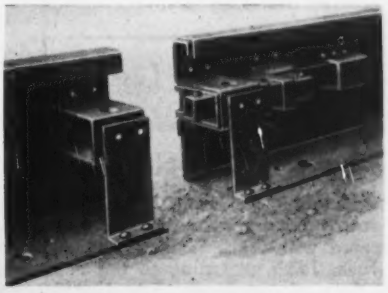


valve and camshaft arrangement is designed so that valve grinding is a simple bench job. Another important feature of the engine is its aluminum pistons, which are of a patented split-skirt type. Six piston rings are used, three of which are compression rings and the other three of which are oil wipers. The accompanying illustration shows the five independently maintained sub-assemblies, showing how the engine block is a simple casting that can be taken out and replaced and how the cylinder head assembly can be removed as a unit.

Auxiliary springs are used on all three sizes, those on the double-reduction models being of the free end cantilever type, while those on the chain-drive models are of the semi-elliptic type with free ends.

New Road Form Use Hot Riveted Details

A new steel road form to which joint locks and other built-up parts are attached by ⅞-in. hot-driven rivets is



being manufactured by the Truscon Steel Company, Youngstown, Ohio. Manufacturers point out that such forms are easily repaired, either bolts or rivets being adaptable. The forms are completely interchangeable, each being equipped with a male element on one end. A 7-in. sliding member is driven through keyways on each two adjoining forms and is held by two stakes to form a rigid joint. The stakes are 3½ in. from the joint, giving double support where it is most needed. The forms are stamped from ⅞-in. steel, all bending of the steel

SPECIAL SAW RIG POWERED BY INDUSTRIAL TRACTOR

For cutting either standing or fallen timber, the Texas Power & Light Company, Dallas, Tex., has developed the saw rig shown in the accompanying illustrations. The apparatus is operated through gears and a belt on the power take-off of a McCormick-Deering tractor.

being accomplished in one operation on one die. It is claimed that forms will take bends of 100-ft. radius because of the short locking apparatus at the joints. Another feature of the joints is that forms of different types can be joined to give perfect alignment and positive rigidity.

Business Notes

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, East Pittsburgh, Pa., announces the election of F. A. Merrick as president of the company. Mr. Merrick was formerly vice-president and general manager.

STANDARD STEEL WORKS COMPANY, Philadelphia, Pa., announces the retirement July 1 of A. A. Stevenson, vice-president in charge of manufacture, after 41 years of continuous service with the company. Mr. Stevenson will continue to carry on many of the other technical activities in which he has been engaged in recent years. He is a past-president and honorary member of the American Society for Testing Materials and a past-chairman of the American Standards Association.

MISSOURI PORTLAND CEMENT COMPANY, St. Louis, Mo., has completed a new $2,500,000 plant for the production of Prestolith Velo cement.

SMITH BOOTH USHER COMPANY, Los Angeles, Calif., has appointed Walter M. Parsons sales manager of its construction equipment business.

JOHN D. OWENS, one of the founders of the Osgood Company, died on June 24 at the age of 72. At the time of his death Mr. Owens was chairman of the board of the Osgood Company and was also serving in advisory capacities in many diversified fields, including lime and stone quarries, grain mills and the largest agricultural and dairy farm in central Ohio.

Construction, Labor and Material

Building Costs Flat as Usual

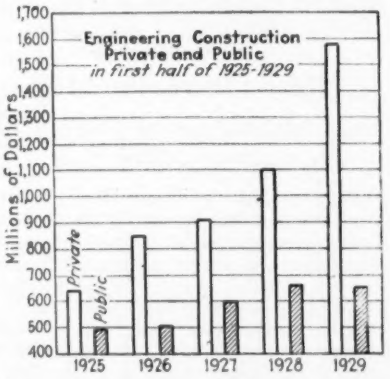
Building costs in June over the entire country averaged 204.2, compared with 203.9 in May and 203.3 in June, 1928, according to the American Appraisal Company. The *Engineering News-Record* Cost Index for general construction in the country stands at 204.77.

Though changes in building costs last month were negligible, several items may be noted. In New York and northern New Jersey, brick with wood frame is up 2.7 points, frame up 3.5, brick with steel frame up 1.2 and reinforced concrete up 1.3 points. The only other difference is a 1-point rise for reinforced-concrete construction in New England and a 0.3-point rise in the Middle Atlantic States.

High Output of First Half Is Continuing

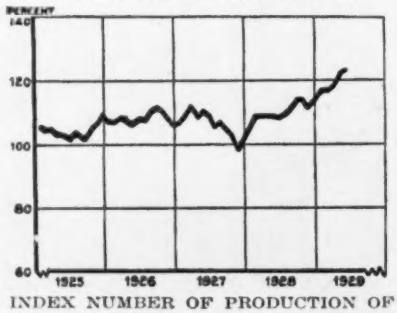
Engineering construction and automobile production for the first six months of 1929 are respectively 25 and 48 per cent ahead of last year. These figures are sufficient to account for the general lead recorded by industrial production this year. The gains have been particularly heavy in iron and steel, and there appears to be no let-up. The daily average for pig iron was not only consistently higher than that for 1928 but with the exception of a 2 per cent drop in June each month beat the preceding month. The half-year sets a record of 21,621,000 tons—4 per cent above the previous record made in the first half of 1923. It is well to note, however, that July shows a drop in the operating rate at the larger furnaces.

Heavy production of iron is paralleled in steel ingot production and in semi-finished products generally. Back in March ingots were 10 per cent ahead of 1928; the figure for the half-year is 17 per cent and is a record. Sales of fabricated shapes—20 per cent above last year—check with the gain in engineering construction. Buying continues heavy, particularly for pipe, plates, bars and sheets, with deliveries ranging from two to four weeks.



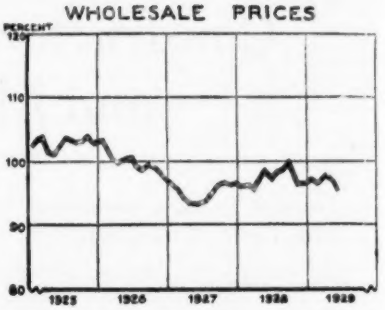
Turning to the materials used almost exclusively in construction, it is found that those entering largely into small operations are under the production figures of last year, confirming the 28 per cent decline in residential building. Shipments are down as follows: common brick, 7 per cent; cement, 9; lumber, 14. Other indicators of the residential slump are porcelain plumbing fixtures, down 24 per cent, and enameled sanitary ware, down 12 per cent, with new orders for these two lines still farther under the figures for last year.

INDUSTRIAL PRODUCTION



INDEX NUMBER OF PRODUCTION OF MANUFACTURES AND MINERALS COMBINED, ADJUSTED FOR SEASONAL VARIATIONS (1923-25 AVERAGE = 100). LATEST FIGURE MAY, 123

WHOLESALE PRICES



INDEX OF UNITED STATES BUREAU OF LABOR STATISTICS (1926 = 100, BASE ADOPTED BY BUREAU). LATEST FIGURE MAY, 95.8.

As the residential decline seems to be a matter of adequate housing rather than of depression, it is quite possible that the slower rate will continue. This decline thus far has been compensated for by the gain in engineering construction. Of first importance is the fact that this gain has been consistent, month by month, as shown by the following weekly averages in millions of dollars:

	1928	1929	Per Cent Increase
January	49.5	79.5	60
February	53.3	91.3	71
March	76.0	90.0	18
April	75.7	79.0	4
May	71.5	94.3	32
June	80.8	82.5	2
First half	68.2	86.2	25

It is worth noting that the contract value in the second half of the year is usually slightly greater than that in the first. In percentage of annual totals the second-half figures for the last three years are: 52.5 (1926), 53.5 (1927), 50.5 (1928). Contracts for the first half of 1929 total $2,239,935,000. The rate for the first week of July in millions is 81, compared with 62 the week before and 78 in the first week of July, 1928.

E. N.-R. Index Numbers

Cost			Volume		
July 1,	1929	204.77	June,	1929	347
June 1,	1929	205.65	May,	1929	395
July 1,	1928	206.65	June,	1928	308
Average,	1928	206.78	Average,	1928	287
Average,	1927	206.24	Average,	1927	263
1913		100.00	1913		100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of July 11, with some comparisons, total as follows:

(In Thousands of Dollars)

	July 11, 1929	July 4, 1929	July 12, 1928
Building:			
Industrial	$12,794	$4,360	$5,643
Commercial	23,831	26,211	35,593
Streets and roads	17,166	11,246	7,777
Other eng. constr.	14,301	35,691	5,779
Total	$68,092	$77,508	$54,792
Total, all classes, Jan. 1 to July 11:			
1929			$2,385,525
1928			1,909,590

CONSTRUCTION NEWS

Some of the Week's Large Projects

AMONG the announcements for the current week are the following:

Proposed Work

Office, etc., Cincinnati, O., Thos. Emery Sons Inc., $8,000,000.

Storage and loft, New York, N. Y., Corporation, c/o Trinity Church, $5,000,000.

Apartment hotel, etc., New York, N. Y., International Magazine Co., bids after Jan. 1, $3,500,000.

Hotel, Akron, O., DeWitt Hotel Co., $3,500,000.

Disposal plant, Anderson, Ind., M. H. Downey, engr., submitted report, $2,850,000.

Irrigation system, Texas, Red Bluff Water Impvt. Dist., Pecos, appropriated $2,000,000 irrigation and $25,000 surveys.

Elevator, Kingston, Ont., Canada Steamship Lines Ltd., Montreal, Que., $2,000,000.

Exchange, Dayton, O., Ohio Bell Telephone Co., $1,750,000.

Plant, North Tarrytown, N. Y., Chevrolet Motor Co., Detroit, Mich., $1,500,000.

Freight terminal, etc., St. Louis, Mo., Southern Electric Terminal Ry., sketches, $1,000,000 freight terminal and $500,000 passenger terminal.

Y. M. C. A., Akron, O., Y. M. C. A., $1,000,000.

Embassy, Wash., D. C., French Government, sketches, $1,000,000.

Hospital, New York, N. Y., Bronx Maternity Hospital, $1,000,000.

Medical, Boston, Mass., Owner, c/o A. P. Pearce, Jr., $1,000,000.

Apartment and store, New York, N. Y., Grand View Constr. Corp., $1,000,000.

Hotel, Pinewald, N. J., W. K. Oltar Jerosky, archt., New York, soon lets contract for Sangor Hotel Corp., Newark, est. $1,000,000.

Theatre, Montreal, Que., Famous Players Canadian Corp., New York, to exceed $1,000,000.

Plant, Cobalt, Ont., Canada Northern Power Corp., Ltd., $1,000,000.

Office, London, Ont., Huron & Erie Mortgage Corp., $1,000,000.

Office, Pittsburgh, Pa., Gulf Refining Co., bids probably in September, general contract $1,000,000.

Store, office, etc., New York, N. Y., C. Vanderbilt, $1,000,000.

Hospital, Lexington and Waltham, Mass., Middlesex Co., W. C. Wardwell, East Cambridge, sketches, $1,000,000.

Bids Asked

Plant, Stockton, Calif., Port Stockton Cement Co., taking segregated bids $3,000,000.

High School, Providence, R. I., July 22, by City, P. Building Dpt., $1,000,000.

Airport, Detroit, Mich., July 17, by Dpt. P. Wks., $1,000,000.

Y. M. C. A., Akron, O., Trustees, Y. M. C. A., takes bids about Sept. 1, $1,000,000.

Bids Received

Road improvements, Pittsburgh, Pa., Comrs. Allegheny Co., from Booth & Flinn, Pittsburgh, $3,344,848 est., $3,500,000.

Hospital, Cleveland, O., City, from C. Shutrump & Sons Co., Cleveland, $1,123,740.

Sewers, etc., Toledo, O., Director P. Service, from E. H. Latham Co., Columbus, $1,119,000.

Contracts Awarded

Power plant, Winnipeg, Man., Winnipeg Hydro-Electric Municipal Development, to John Gunn & Sons, Ltd., and to Stewart & Cameron, Ltd., Winnipeg, est., $8,000,000.

Power plant, South Amboy, N. J., Jersey Central Power & Light Co., Asbury Park, general contract to Deakman-Wells Co., Jersey City, est., $5,000,000.

Customs, Toronto, Ont., S. E. O'Brien, secy., Ottawa, to Peter Lyall & Sons Constr. Co., Montreal, Que., for Dominion Govt., Ottawa, $2,000,000.

Hospital, Coatesville, Pa., U. S. Veteran's Bureau, Wash., D. C., general contract to A. C. Samford, Montgomery, Ala., and others, totalling $1,629,283.

Garage, New York, N. Y., Kent Garage Investing Corp., to F. T. Ley, New York, est., $1,400,000.

Administration, Wellesley, Mass., Wellesley College, to L. D. Willcut & Sons Co., Boston, $1,250,000.

Theatre, New York, N. Y., Highbridge Realty Co., to Aronberg-Fried Co., New York, est., $1,250,000.

Administration, etc., Hawthorne, Nev., Spec. 5835, Bureau Yards & Docks, Navy Dpt., Wash., D. C., to Mittry Bros. Constr. Co., Los Angeles, Calif., $1,090,400.

Grain elevator, Port Arthur, Ont., Saskatchewan Elevators Ltd., general contract to Barnett-McQueen Co., Ltd., Fort William, est. $1,000,000.

Medical, etc., New Haven, Conn., Yale University, Bd. Trustees, to Sperry & Treat, New Haven, est. $1,000,000.

Landscaping, Pittsburgh, Pa., Allegheny Co., to Freeland, McHale, Pattan, Inc., Pittsburgh, est. to exceed $1,000,000.

Store, etc., Brooklyn, N. Y., Ascutney Realty Corp., to W. Kennedy Co., Brooklyn, est., $1,000,000.

Office, New York, N. Y., Brandish Johnson Estate, to W. F. Kenny Co., New York, est., $1,000,000.

Plant, Kingsport, Tenn., Tennessee Eastman Corp., Rochester, N. Y., to Gauger-Korsmo Constr. Co., Memphis, est., $1,000,000.

Public Bond Elections, coming and decided, are listed on Construction News page 18.

Construction News of the Week

Waterworks

Proposed Work

Calif., San Diego—Water distributing system, complete sewerage system in Chesterton. G. W. Jorgensen, City Hall, engr.

Colo., Fowler — City Council, waterworks, 50,000 gal. tank. A. A. Weiland Eng. Co., Pueblo, engrs.

Conn., Newington — For 6 in. main from Brockett to Ann Sts. $16,000.

Ill., Princeton—Iron removal, water supply improvement plant, $40,000. Shields, Jordan & Roe, 222 North Wells St., Chicago, engrs.

Ia., Waterloo — Waterworks improvements, $15,000. J. S. Bartley, 903 Pioneer Natl. Bank Bldg., Kansas City, Mo., engrs.

Kan., Montezuma—Waterworks. To exceed $15,000. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs.

Mich., Monroe—City, waterworks, incl. electrically driven low pressure pumping station at Lake Erie, 20 in. c.i. main to Detroit Ave., electrical transmission to low pressure station, 4 mi. 10- to 14-in. mains for distribution incl. low pressure loop around entire city. S. M. Weaver, Monroe, supt. Water Works.

Mo., Ozark—Soon takes bids 15,000 ft. 4- to 8-in. c.i. mains, fire hydrants, valves, boxes, 75,000 gal. elevated tank, deep well house, $10,000 additional bonds voted. A. C. Adams, City Hall, engr.

N. J., Perth Amboy—City Comn., installing meters, pumping equipment. $10,000. P. P. Costello, city clk.

N. Y., Buffalo — G. Fisk, comr. Plant & Structures, Municipal Bldg., 2,486 ft. 20 and 36 in. mains in Bailey Ave. C. E. P. Babcock, city engr.

O., Akron—Bd. Control, new 35 m.g. reservoir in Belts Corner Dist. $250,000.

O., Dover—Bd. Control soon takes bids new 750 g.p.m. pump at Auxiliary Park Sta. $20,000.

Okla., Apache—Preliminary plans new drilled wells, additional pumping equipment. $16,000. F. E. Fearing, Apache, engr.

Okla., Byars—Surveys new waterworks. $25,000. A. B. Carson, Norman, engr.

Okla., Fletcher — New waterworks. $30,000. Milliken & Whiteneck, Southwest Natl. Bank Bldg., Oklahoma City, engrs.

Okla., Hollis — Preliminary plans new concrete reservoir, pumping equipment. $30,000. R. R. Cox, mayor.

Okla., Rosedale—New waterworks. $15,000. A. B. Carson, Norman, engr.

Tex., Ballinger—Waterworks extension, incl. distributing system, reservoir, pumping equipment. R. F. Davis, Nacogdoches, engr. Noted Feb. 7.

Ont., Oakville—Town Council, rein.-con. reservoir on Red Hill in connection with waterworks. $55,000. R. Smith, Oakville, engr.

THESE reports are grouped under each class (water-works, sewers, etc.) and under each stage of the work (proposed, bids asked, etc.) according to the alphabetical order of states.

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk, or corresponding official.

Ont., Waterloo—Town, auxiliary waterworks plant, incl. new pumping equipment, centrifugal 3 stage, c.i. mains, valves, hydrants, $15,000. C. E. Necker, Waterloo, engr. Noted May 30.

Ont., Windsor — Council, extending 12 in. watermain, sewer in Tecumseh Bd., Howard Ave., St. Paul and Charles Sts., in East Windsor. $57,462. J. J. Newman, Davis Blk., engr.

Bids Asked

Mass., Boston — July 12, by Dpt. Mental Diseases, State House, new underground mains at Boston State Hospital, $15,000 or more.

Mass., Weston (br. Boston) — July 23, by Metcalf & Eddy, engrs., Statler Bldg., Boston, extending waterworks, Contrs. 6, 7 and 5, for Town.

Mich., Detroit—July 31, by Bd. Water Comrs., 735 Randolph St., furnishing, laying 42- to 72-in. pipe in Warren Ave. and Springwells Sts. Grounds. G. H. Fenkell, genl. mgr. and ch. engr.; adv. E. N.-R. July 11.

Mich., Detroit—July 31, by Bd. Water Comrs., Water Bd. Bldg., 5,000 kw. steam turbo-generators in power plant Springwells Sta. G. H. Fenkell, genl. mgr. and ch. engr.; adv. E. N.-R. July 11.

Mo., St. Louis—See "Streets and Roads."

N. Y., Brooklyn — July 16, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Avenue P, 3rd, 17th, 23rd, Myrtle, Rockaway, Seaview, and Thatford Aves., Bradford, Calyer, Clinton, Henry, Little, Livingston, Placific, Prospect Sts.

N. Y., Central Square—Aug. 7, by Bd. Village Trustees, at office C. J. Yorkey, atty., installing water supply. W. T. Field Engineers, Inc., Watertown, consult. engrs.; adv. E. N.-R. July 11.

N. Y., St. George—July 16, by J. J. Dietz, comr. Water Supply Gas & Electricity, Municipal Bldg., New York, mains in Chelsea Rd., Borough Pl., Henderson, Rathbun and Stafford Aves., John, Metclafe, Richmond, State and West Union Sts., Richmond Boro.

N. C., Concord—July 16, by City, improving waterworks.

Okla., Atoka—See "Contracts Awarded."

Que., Sorel—July 12, by Town Council, water filtration plant, pumping station, water intake, discharge lines, elevated steel tank. $150,000. A. Plamondon, 30 St. James St., Montreal, engr.

Contracts Awarded

Colo., Golden—City Council, replacing 4½ mi. stave pipe line of waterworks to Hardesty Mfg. Co., 3063 Blake St., Denver. Est. $35,000.

Colo., Palisade—J. W. Hoke, city clk., 5 mi. water pipe line, 500,000 gal. reservoir, to M. C. Loftus, 1406 Columbine St., Denver, $26,328.

Ga., Dalton—Rein.-con. coagulating basins, to W. B. Lloyd & Son, Rome, $20,980. Noted May 30.

Ill., Tessville—See "Streets and Roads."

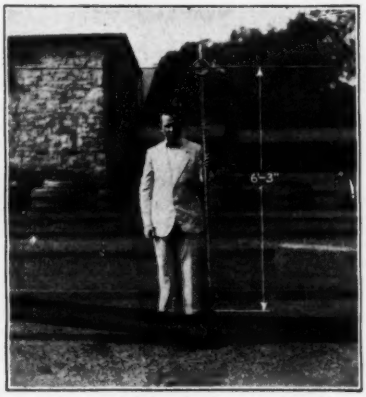
See proposal advertising on page 128

Constr. News page 13

LEADITE

Trade Mark Registered U.S. Pat. Office

"Some Test"



At a *Deflection* of over 6'–3", and under a *pressure* of over 300 lbs, —these LEADITE JOINTS *"held tight"*

Hard to believe, isn't it?—yet it's absolutely true, and can be verified by actual test figures recorded by the nationally known company, under whose auspices the test was conducted. Here are a few "highlights" about the remarkable results obtained from this test:

Seven lengths of 6" c. i. bell and spigot pipe (length 84', capped and plugged, total 8 joints) were jointed with LEADITE,—average 2-7/16 pounds LEADITE used per joint. These 8 lengths were supported on blocking, and the line was levelled. The intermediate blocking then was knocked out—allowing line to drop—air pressure at this stage being 95 lbs. per square inch and the deflection 27". Line was then subjected to water pressure.

To make a long story short, a final deflection under water pressure of 6' 3" was reached (see actual test photos above). At this stage the water pressure was over 300 lbs. per sq. inch. The effective depth of LEADITE in all joints in contact with the iron was only 1" from face of bell, (customary practice is 2½" depth of joint).

The tightness of the line and the results obtained from these tests were considered remarkable.

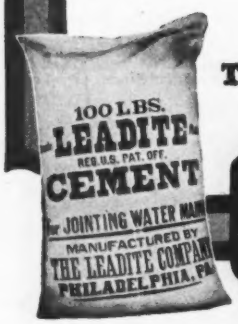
These tests conclusively proved the great flexibility of LEADITE joints and bell and spigot pipe,—and also the wonderful holding qualities of LEADITE.

Incidentally, after the tests, the entire pipe line was "thrown" from its end supports,—this rough treatment did not break the LEADITE Joints or the pipe.

Can you conceive of a more severe test than this?

The pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
"Saves at least 75%"

The LEADITE COMPANY, Land Title Bldg., Phila, Pa.



No Caulking

Waterworks (Continued)

Md., Towson—Baltimore Co., mains in streets in Sudbrook Park, Rosedale, Fairlawn, Baltimore, Highland, Ruston, Towson and Colgate, to W. H. Thompson, Relay. $20,871. Noted June 6.

N. H., Woodsville—Town, water supply, to C. D. Marsh Constr. Co., Woodsville. Est. $15,000 or more. Noted June 20.

N. J., Lodi—Bd. Boro Council, Boro Hall, 6 in. main in Linden St., Christopher and Passidino Aves., to Neyland Plumbing Supply Co., 161 Quincy St., Passaic. Est. $15,000. Noted June 13.

N. Y., Brooklyn—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Coney Island Ave. and Avenue V to N. DeStefano, 378 Woodstock Ave., West New Brighton. $28,993. Noted June 13.

N. Y., Long Island City—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in 13th, 26th, 41st, 46th, 6th Aves., to S. Gallucci & Son, Railroad Ave., Corona. $2,984. Noted June 13.

N. Y., Scarsdale—A. Boniface, village engr., Village Hall, 1,700,000 gal. reservoir, to Petroleum Iron Wks., 25 West 43rd St., New York. Noted June 6.

O., Cleveland—Cuyahoga Co., 1,000 ft. 6- to 12-in. c.i. main in Brecksvill Rd., Impvt. 358, to E. Cesa, 2462 Baldwin Rd., $5,192; 9,000 ft. 8- to 12-in. in Chippewa Rd., Impvt. 1357, to George & Ameen Constr. Co., Erie Bldg., $28,760. Noted June 13.

Okla., Atoka—Waterworks, distribution system, own forces, $30,000 bonds voted for same. Benham Eng. Co., Perrine Bldg., Oklahoma City, engrs.

Pa., Altoona—To D. R. Vipond, Pine St., improving Kittanning Point Reservoir. Contr. 1 $66,450, Lake Altoona $31,902, improving reservoir, widening channel and tunnel depression, Contr. 2, impounding reservoir, Contr. 3, and Scotch Run Dam, Contr. 4 $34,841. Grand total $133,193.

B. C., Vancouver—Greater Vancouver Water Dist., fifty thousand 32- to 36-in. riveted steel pipe, to Vancouver Eng. Wks. Ltd., 519 6th Ave. W., $292,963.

B. C., Vancouver — City, 200 hydrants, to Terminal City Iron Wks., 1949 Albert St., at $80.90 each; valves, to Jenkins Bros. Ltd., 1084 Homer St., $8,622. Noted June 6.

Sewers

Proposed Work

Calif., San Diego—See "Waterworks."

Ga., Columbus—City, H. B. Crawford, mgr., sewerage system improvements, incl. triplet sewer at Schuessler's Ditch, open sewers in North Highland Section and Rose Hill. $400,000 voted for same. G. N. Mitcham, City Hall, engr. Noted June 13.

Ill., Decatur—Sanitary and storm sewers in Southmoreland Pl. $41,293. M. P. O'Brien, City Hall, engr.

Kan., Montezuma — Sewerage system. To exceed $25,000. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs.

Mich., Ecorse (br. Detroit)—Storm sewerage system, incl. 12- to 81-in. concrete, vitr. monolithic concrete pipe. $50,000. Mason L. Brown & Son, 605 Capital Theatre Bldg., Detroit, engr.

Mich., Mt. Clemens—Macomb Co., Mound Park Drain, 23,800 ft. 18- to 66-in. concrete pipe.

Minn., St. Paul—Sewers in Stewart St. between Rankin and Davern Aves. $27,795. J. W. Kelsey, city engr.

Mo., Pacific—Preliminary plans sewerage system. $40,000. Russell & Axon, 408 McDaniel Bldg., Springfield and 6200 Easton Ave., Wellston, engrs.

Neb., South Sioux City—For 60,000 ft. 18 in. concrete sanitary sewer, 2 pumping stations in Randolph and James Sts. $100,000. W. E. Buell & Co., Insurance Exch. Bldg., Sioux City, Ia., engrs.

N. J., Emerson—Bd. Boro Council, Boro Hall, preliminary plans sanitary sewerage system, incl. disposal plant, pumping station. $250,000. T. H. Bowe, 110 William St., New York, engr.

N. J., Newark—Bd. City Commrs., City Hall, preliminary plans rein-con. storm sewer in Weequahic Park. $40,000. J. Costello, city engr.

N. J., River Edge—Bd. Boro Council, Boro Hall, sanitary sewerage system, gravity flow. $265,000. J. Zabriskie, North Hackensack, boro engr. Noted July 4.

N. Y., Richmond Hill—Dunton Lodge Community Assn. Van Wyck Blvd. and 107th Ave., private sewer 17 blocks between 135th and 130th Sts. and 109th and 105th Aves. $30,000.

Okla., Fletcher—Sanitary sewerage system, $25,000. Milliken & Whiteneck, Southwest Natl. Bank Bldg., Oklahoma City, engrs.

Tex., Richmond—For 7 mi. sewerage system, $50,000. Edminster & Cove, Electric Bldg., Houston, engrs. Noted July 4.

Tex., San Antonio—Survey; sewage disposal plant to serve East Side. $300,000. Hawley & Freese, 301 Frost Bldg., engrs. I. Ewig, city engr.

Wis., Frederic—T. Wiprud, city clk., sanitary sewerage system. $40,000. Druar & Milinowski, 500 Globe Bldg., St. Paul, engrs.

Ont., Grimsby—Town Council, sewage disposal plant, $25,000. G. G. Bourne, Grimsby, engr.

Ont., Niagara Falls—For 4-5 mi. 8 in. and up vitr. clay sewers. $150,000. H. S. Goddard, City Hall, engr.

Ont., Owen Sound—For 8 in. and up vitr. tile storm sewers. $50,000. R. C. McKnight, City Hall, engr.

Ont., Toronto—York Twp., 4,500 ft. 8 in. and up sanitary service sewers in Tichester Rd. and 5 avenues. $44,460. F. B. Goedike, 40 Jarvis St., engr.

Ont., Windsor—See "Waterworks."

Que., Chambly Canton—Municipality, sewerage system. E. Gohier, 10 St. James St., Montreal, engr.

Bids Asked

Fla., Miami — July 15, by City, sanitary sewers, pumping station in Shenandoah and Bryan Park Additions.

Ill., Rockford—Aug. 8, by Sanitary Dist. of Rockford, G. J. Boehland, pres., 130 North 1st St., Intercepting Sewer Project, Divs. F, G, H, I, J, K, M and N. Pearce, Greeley & Hansen, 6 North Michigan Ave., Chicago, engrs.; adv. E. N.-R. July 11.

Ia., Cedar Rapids — Bids about Aug. 25, pumping plant, 4 mi. 24- to 42-in. intercepting sewer, $270,000. Howard R. Green Co., Bever Bldg., engrs. Noted June 6.

La., Port Allen—July 30, by Bd. Aldermen, 11 mi. sanitary sewerage system, two 350 g.p.m. sewage pumps, 4,100 ft. c.i. force mains, pump station. L. J. Voorhies, Baton Rouge, engr. Noted Feb. 28.

Mass., Dedham—July 12, by Sewer Comrs., Town Hall, 2,850 ft. 8 in. sewers. E. Worthington, Dedham, engr.

N. J., New Milford—July 16, by Bd. Boro Council, Boro Hall, storm drainage system in Graphic Blvd. $50,000. Former bids rejected. A. Noack, 236 Main St., Hackensack, boro engr. Noted June 27.

N. Y., Albion—July 22, at office Bd. Village Trustees, reconstructing sewage disposal plant. J. F. Skinner, Rochester, consult. engr.; adv. E. N.-R. July 11. Noted July 4.

N. Y., Brooklyn — July 17, by J. J. Byrne, pres. Brooklyn Boro, Boro Hall, sewer in Van Sinderen Ave., West 5th, West 4th, West 3rd, 74th, Hawthorne and East 17th Sts.

N. Y., Long Island City—July 15, by J. J. Halleran, acting pres. Queens Boro, Queens Subway Bldg., sewers in Normal Rd., College Pl., Laurel Hill, Parsons and Springfield Blvds., 7th, 5th, 4th, 3rd, 63rd, 80th, 81st, Juno, Loubet, Leverich, 71st (41st), Monroe, Irving, 148th, Oceania (Gardiner), 209th, 204th, 203rd, 208th, Prince, 132nd, 146th, 153rd, 147th Sts., Jackson, 25th (Schutz), Herrick, Continental, 34th, 100th, Jamaica, Sutter Aves.; constructing pumping station, at Gardiner St. and 46th Ave.

N. Y., New York—July 17, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewers in Griswold, Harper, Bouck and Astor Aves.

N. Y., Orangeburg—July 31, by Dpt. Mental Hygiene, Capitol, Albany, sewage disposal system, outfall sewer, Rockland State Hospital. F. W. Parsons, comr.; adv. E. N.-R. July 11.

N. Y., Wassaic — July 31, by Dpt. Mental Hygiene, Capitol, Albany, storm, sanitary sewers, Wassaic State School, for Mental Defectives, Dutchess Co. F. W. Parsons, comr.; adv. E. N.-R. July 11.

Bids Received

O., Toledo — Director P. Service, June 25, treatment plant, bulkhead, sea wall, from E. H. Latham Co., 447 Neilston St., Columbus, $1,116,000. Est. $1,230,000. Noted June 13.

Contracts Awarded

Conn., Greenwich — Town, sewage disposal plant, in Coscob, to Bridgeport Dredge & Dock Co., 1024 Main St., Bridgeport, $149,000. Noted May 30.

Ill., Chicago—Bd. Local Impvts., City Hall, drains in North Ashland Ave., to M. Divito, 2234 Campbell Park; South Hoyne Ave., to M. Murphy, 5753 South Peoria St.; South Trumbull Ave., to A. Santucci, 616 South Ashland Blvd.; Longwood Dr., Hopkins Pl., Longwood and Howland Aves., to A. Scully, 4504 Wrightwood Ave.; North Normandy and North Rutherford Aves., to N. Ranieri, 5036 Montana St. Noted June 13.

Ill., Chicago—See "Streets and Roads."

Ill., Tessville—See "Streets and Roads."

Kan., Salina — C. E. Banker, city clk., 11,840 ft. 12- to 72-in. sewers in Crawford and South Sts., Dist. 40, to H. J. Taylor Constr. Co., Salina, $110,722. Est. $125,000. Noted Mar. 7.

Mass., Maynard—Sewer Comrs., 3 mi. sewer Contr. 15, and 3 mi. Contr. 16, to Zoppo & Civitarise, 480 Metropolitan Ave., Hyde Park, $32,000 and $37,000 respectively.

Mich., Monroe—Monroe Co., dredging cut for 4½ mi. Halfway Creek Drain, Whiteford Twp., to G. Dreyor, Adrian, $25,000; 5 small concrete, steel bridges, to L. Hutting, Ida. Noted Apr. 11.

Mich., Pontiac—H. A. Maurer, city clk., 65,000 ft. 6 in. to 54 in. concrete, rein.-con., vitr. clay sewers in LeBaron Farms and Joslyn Gardens, to R. A. Mercier, 5435 Wesson Ave., Detroit, $326,561.

Mo., St. Louis—See "Streets and Roads."

N. J., Westfield—Rahway Valley Joint Sewer Meeting, 37 Elm St., Sect. 2, Rahway Valley Trunk Sewer, to Mountaintown Constr. Co., Montclair, $158,821. Noted May 30.

O., South Euclid (br. Cleveland)—Village, sewers in Avondale Rd., to Cannavino Co., c/o owner, $4,267; Dis. 4, to E. P. Langenhan Co., Marshall Bldg., Cleveland, $32,000; Stillmore Rd., to Haddad-Mall Co., Hanna Bldg., Cleveland, $11,515; Verona Rd., to George & Ameen, Erie Bldg., Cleveland, $12,034. Grand total $59,816.

O., Youngstown—Storm water sewer in Ohio Ave., to S. Merletti, 395 Bway., $27,305. Est. $25,000.

Pa., Phila. — Dpt. P. Wks., Bureau Engineering & Surveys, A. Murdock, dir., branch sewers in G St., to Almino Frunzi, 513 High St. $6,959; Greenway St., to S. Vallone & Co., 2008 McKean St. $3,183; main sewer in Hegerman and Robbins Sts., to M. J. Driscoll, 100 Apsley St. $29,751; Island Ave., 80th and 75th Sts., to Thomas Burke & Co., Widener Bldg., $235,387. Grand total $275,280. Noted June 13.

Tenn., Nashville—Bd. P. Wks., Sects. 1 and 2, Whitland-Sunset Park Trunk Sewer, to W. J. Bryson Paving Co., Nashville, $27,370.

Wash., Tacoma—City Comn., trunk sewer in Cheyenne St., to Thomas Scalzo & Co., 1708 22nd St., Seattle, $41,232. Noted June 13.

Wis., Milwaukee—Sewerage Comn., 508 Market St., R. Cramer, ch. engr., 3,982 ft. 60 in. c.i. pressure sewer in Detroit, Jefferson, Erie Sts., to Zimmermann & Zimmermann, 2826 State St., $377,536.

Ont., Hamilton—Storm sewers in Barton and Sterling Sts., day labor, under supervision W. L. McFaul, city engr. $89,000.

Ont., Sandwich—Town Council, 8 in. and up vitr. tile sewers in Granville Crescent and Virginia Court, to De Santi & Dominita, 501 Mercer St., Windsor, $4,054; Melbourne Rd., Marlborough Blvd. and 3 streets, to Colloutti Bros., 612 Longlois Ave., Windsor, $31,329.

Waste Disposal

Proposed Work

Ind., Anderson—M. H. Downey, engr., Anderson, submitted report for garbage disposal plant near White River at Moss Island near here, also increased water mains, larger sewers, increased space at local water plants. $2,850,000. Noted Feb. 21.

N. J., Cedargrove — Twp. Com., Township Hall, disposal plant, Little Falls Rd. $100,000. T. F. Bowe, 110 William St., New York, engr.

Contracts Awarded

N. Y., Oakwood (sta. Staten Island)—J. A. Lynch, pres. Richmond Boro, Boro Hall, St. George, erecting 2 incinerating furnaces Hammerly Ave., to Nye Odorless Incinerator Corp., 50 East 42nd St., New York, $42,275.

Bridges

Proposed Work

Calif., Sacramento—Sacramento Co., timber truss bridge across Snodgrass Slough, Sacramento River. $40,000. C. W. Deterding, Sacramento, co. engr.

D. C., Wash.—District Comrs., District Bldg., reconstructing bridge across Anacosta River, foot 11th St. S. E. $120,000.

Fla., Miami Beach — Bridge over Indian Creek, on 41st St. City Eng. Dpt., engrs. R. Pancoast, Lincoln Rd., archt. Noted May 16.

Ill., Edwardsville—Madison Co. preliminary plans rebuilding 25 bridges in various sections, damaged by recent floods. $60,000. W. E. Howden, Court House, engr.

Ill., Joliet—City and Illinois Deep Waterway surveys bridge over Illinois River, on McDonough St. $355,000. L. D. Cornish, Division of Waterways, Springfield, engr.

N. J., Jersey City—Bd. Freeholders, Hudson Co., Court House, repairing Arlington Ave. Bridge over Central R.R. of New Jersey, and Baldwin Ave., Bridge over Pennsylvania R.R. $25,000. F. J. Radigan, Court House, co. engr.

O., Cleveland—New York, Chicago & St. Louis R.R., A. C. Harvey, ch. engr., Terminal Tower, rein.-con. bridge, on East Buckeye Rd. $90,000.

Okla., Asher—Pottawatomie Co. (Tecumseh), 6 span, 90 ft. rein.-con. bridge. $26,000. J. H. Merkle, Tecumseh, engr.

Okla., Lone Wolf — Kiowa Co., preliminary plans 3 span 130 ft. steel, I-beam bridge over Elk River. $25,000. O. C. Wilson, Hobart, engr.

Pa., Fayette City — Corporation, c/o O. D. Strader, 106 Park Blvd., Clarksburg, W. Va., toll bridge over Monongahela River. $500,000. Maturity about Jan. 1, 1930. Robinson & Steinman, 117 Liberty St., New York, engrs.

Constr. News page 14

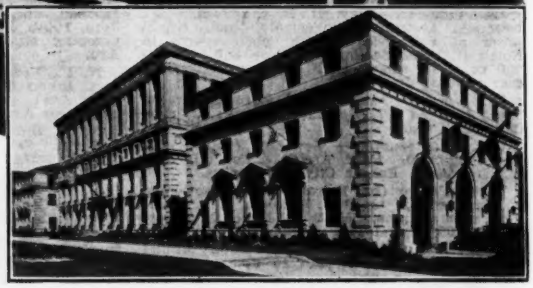
In Public Buildings *everywhere*

City Hall,
Los Angeles, Calif.
—*Bethlehem H-Columns were used in the framework of this building.*

Cuban
National Capitol Building,
Havana, Cuba.
— *Photograph, Courtesy American Photo Studios*

Left: Cook County Criminal Court House, Chicago, Illinois.

Right: Public Safety Building, Toledo, Ohio.



Municipal
Office Building,
Baltimore,
Maryland.

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Bridges (Continued)

Texas — Chicago, Rock Island & Pacific Ry. Co., W. H. Peterson, ch. engr., Chicago, Ill., will not construct 450 ft. concrete, steel bridge over Canadian River. $1,500,000. This corrects report in June 6 issue.

Tex., Port Arthur—See "Unclassified."

Ont., Hamilton—City Council surveys replacing 550 ft. steel, concrete high level bridge with new bridge western entrance of city. E. H. Darling, 612 Piggott Bldg., consult. engr.

Bids Asked

Arkansas — July 18, by State Hy. Comn., Little Rock, bridges on Job 1120, Union and Ashley Counties, $400,000—Job 960, Boone Co. $30,000. C. S. Christian, state hy. engr.

Arkansas — July 18, by State Hy. Comn., Little Rock, rein.-con., steel bridge over Red River on Job 3112, Miller and Lafayette Counties. D. H. Blackwood, Little Rock, chn.; adv. E. N.-R. July 11.

Ind., South Bend—July 22, by Comrs. St. Joseph Co., constructing county line bridge, on Ash Rd. $160,000. F. P. Crowe, co. aud.

Minn., Clearwater—July 22, by E. R. Anderson, aud. Wright Co. (Buffalo), C. S. Wheaton, Jr., aud., Sherburne Co. (Elk River) and N. Thomey, aud. Stearns Co. (St. Cloud), steel bridge over Mississippi River. $25,000. Noted Oct. 18.

Minn., St. Paul—July 16, by K. L. Fieseler, city purch. agt., 3,267 ft. rein.-con. viaduct, incl. approaches, 45 ft. wide, connecting 3rd St. and Daytons Bluff. $600,000. J. W. Kelsey, city engr.

New Mexico—See "Streets and Roads."

North Carolina—July 16, by State Hy. Comn. **(P. means Project)**, bridges, culverts on P. 7770, Wilkes Co., $68,000—P. 2050 and P. 2060, Craven Co., $52,000 and $60,000 respectively—P. 827, Cleveland Co., $34,000. J. D. Waldrop, Raleigh, engr.

Pa., Harrisburg—July 30, by Commonwealth, through B. E. Taylor, secy. Property & Supplies, Capitol Bldg., constructing West Plaza Approach, memorial pylons, completing Soldiers and Sailors Memorial Bridge. Contr. 3. J. E. Greiner Co., Lexington Bldg., Baltimore, Md., consult. engrs.; adv. E. N.-R. July 11. Noted Aug. 18, 1927.

Pa., Phila.—See "Streets and Roads."

Wash., Seattle — Aug. 2, by Bd. P. Wks., C. B. Bagley, secy., County-City Bldg., West Garfield Street Bridge, incl. 17,061 cu.yd. concrete, 1,150 tons reinforcing, 950 tons structural steel. W. D. Barkhuff, Seattle, engr. Noted June 6.

Bids Received

Pa., Pittsburgh—Comrs. Allegheny Co., Court House, July 2, sub-structure for McKees Rocks-Northside Bridge, from Dravo Contg. Co., 34th and Schuylkill Sts., Phila., $1,780,150. Est. $1,900,000. Noted June 20.

Contracts Awarded

California — State Hy. Comn., Sacramento, timber bridge across Little Sur River, about 14 mi. south of Monterey, to Lord & Bishop, Oroville, $27,454. Noted June 6.

Calif., San Bernardino—San Bernardino Co., 530 ft. rein.-con., steel, bridge on La Cadena St., to A. Johnson, 517 El Centro St., South Pasadena, $47,812. Noted June 6.

Ill., Joliet—City, three 39 ft. span rein.-con. bridge with 36 ft. roadway, 2 sidewalks over Hickory Creek, at East Washington St., to Powers-Thompson Constr. Co., 221 South Chicago St., $28,432. Noted June 20.

Ill., Peoria — Bridge over Illinois River at Cedar St., sub-structure, to Congress Constr. Co., Chicago, $374,500; superstructure, to Kelly-Atkinson Constr. Co., 37 West Van Buren St., Chicago, $463,000. Est. $1,000,000. Noted May 16.

Ia., Clinton—Clinton Co., 4 I-beam bridges, 7 box culverts, to J. Anderson & Son, Maquoketa, $22,901; 2 I-beam and 1 pony truss bridges, to Lundgren-Reis Co., 125 College St., Des Moines, $15,034.

Ia., Le Mars—See "Streets and Roads."

Ia., Maquoketa — Johnson Co., high truss bridge, to T. Jensen, St. Cloud, Minn., $19,906; dismantling, hauling, re-erecting old high truss bridge to P. Jayne, Cedar Rapids, $2,334.

Kan., Dodge City—Ford Co., ten 45 ft. concrete span bridge, 20 ft., on Sparsville-Ford-Bucklin Rd., 7.5 mi. from Bucklin, to Rand-Miller Constr. Co., Kansas City, Mo., $28,864. Noted Feb. 14.

Michigan — R. W. Roberts, resident engr., Saginaw, F. B. 1 of 37-14-1, C-2, two 60 ft. span steel deck girder, Isabella Co., to Price Bros., East Saginaw St., Lansing, for State Hy. Dpt., Lansing, $31,228 incl. cement. Noted May 30.

Michigan — R. W. Roberts, resident engr., Saginaw, M. Bridge 1 of 9-1-21, C-2, three 60 ft. spans, steel deck cantilever, Bay Co., to Wicks Eng. & Constr. Co., 1441 Blunft St., Des Moines, Ia., for State Hy. Dpt., Lansing, $55,987. Noted May 23.

Michigan—H. I. Davies, division engr., Escanaba, M. B. 1 of 21-13-11, C-2, seven 50 ft. span steel deck girder, Delta Co., to D. Graham, North Hibbing, Minn., for State Hy. Dpt., Lansing, $63,916 incl. cement. Noted May 30.

Michigan — C. L. Cowgill, resident engr., Plymouth, Assessment Dist. Bridge 1 of 63-20-12, C-2, two 60 ft. span steel deck girdere, Oakland Co., to Walter Toebe & Co., Shingleton, for State Hy. Dpt., Lansing, $98,596. Noted May 23.

Miss., Laurel—Bd. Supervs. Jones Co., rein.-con. bridge over Tallahala Creek on Laurel-Ovatt Rd., to E. J. & J. P. Berry, Laurel, $37,731.

Neb., Alda—G. E. Nuemann, clk. Hall Co., Court House, Grand Island, bridge over Platte River, near here, to Allied Contractors, Inc., 1803 Douglas St., Omaha, $50,680. Noted June 6.

Neb., Ogallala — Keith Co. and State Hy. Comn., Lincoln, bridge over South Platte River, south of here, to Western Bridge & Constr. Co., 3867 Leavenworth St., Omaha, $51,740; approach fills, to Edwin Walker, North Platte, $9,000. Noted June 6.

New Jersey — State Hy. Comn., Trenton, 3 bridges on Route 25, Sect. 8-A, Rahway and Linden, Union Co., to W. J. Wilck, 358 Laurie St., Perth Amboy, $17,989. Noted June 20.

New York—A. W. Brandt, comr. Hys., Albany **(e.e. means engineers estimate)**, bridges in Genesee Co., to Ingersoll & Barhite, Medina, $36,765 e.e. $51,246—Herkimer and Oneida Counties, to W. S. Meserve & Co., Buffalo, $95,075 e.e. $121,703—Hamilton Co., to Fort Schuyler Eng. & Contg. Co., Inc., Utica, $79,916 e.e. $113,067—Schoharie Co., to M. A. Murray, Troy, $64,825 e.e. $98,239. Grand total $276,581. Noted June 6 under "Streets and Roads."

N. Y., Southampton — Town, G. W. Wines, supt., Shinnecock Bay Bridge, to Harrison Constr. Co., Miami, Fla. $150,000. Noted May 16.

Tex., Dallas—Dallas Co., c/o C. E. Gross, aud., 2,500 ft. rein.-con. bridge over Trinity River, Corinth St., to F. Parrott, 1614 Amer. Exch. Bank Bldg., Austin, $353,414. Est. $400,000.

Tex., Houston—City, c/o W. E. Monteith, mayor, rein.-con. bridge, timber piling approaches, Lowell St., to J. P. Miller & Co., 516 Esperson Bldg., $36,955. Est. $37,000.

Vt., East Rupert—Town, rein.-con. bridge on site of old Dean Bridge, to D. E. O'Brien Constr. Co., Whitehall, N. Y. Est. $25,000.

Washington—State Hy. Comn., Olympia, redecking Columbia River Bridge at Wenatchee, Douglas and Chelan Counties, to J. F. Ward, 509 Lyon Bldg., Seattle, $46,865.

West Virginia—State Rd. Comn., Charleston bridges **(b)** substructure **(c)** superstructure **(1)** Project 3311, Putnam Co. **(2)** Project 3420, Putnam Co. **(3)** Wyoming Co. **(4)** Calhoun Co. **(5)** Gilmer Co. **(6)** Project 152-E, Randolph Co. **(7)** Project 152-F, Randolph Co., to W. F. Adkins, Myra **(a1)** $12,750—to Monty Bros., Charleston **(a2)** $32,987—to Zondo & Vecellio, Williamson **(a3)** $9,849 — to J. R. Janerio, Charleston **(b4)** $11,975—to E. R. Mills, Charleston **(c4)** $10,200—to Atlantic Bridge Co., Charleston **(b5)** concrete $28,708 **(c5)** $35,689—to Clark & Lewis, Luray, Va. **(b6)** $7,223 **(c6)** $15,093 **(c7)** $4,948—to Starcher & Anglin, Buckhannon **(b7)** $2,476. Grand total $172,113. Noted June 6.

Dams

Contracts Awarded

Ont., Armprior—Town, dam across Madauaska River, to Grant Bros. Constr. Co., Bank St., Ottawa, $87,000.

Railways

Proposed Work

Missouri—See "Contracts Awarded."

Texas—Kansas City, Mexico & Orient R.R. of Texas, H. E. Beard, ch. engr., Wichita Falls, Kan., bids after July 15, extending 85 mi. main line from Alpine to Presidio. Noted Apr. 4.

Texas — San Antonio, Uvalde & Gulf R.R. Co., C. S. Kirkpatrick, ch. engr., Houston, constructing 4.7 mi. railroad from Brundage south. $61,669.

Bids Asked

New York—July 17, by G. U. Harvey, pres. Queens Boro. Queens Subway Bldg., Long Island City, relocating, laying new tracks, overhead construction of Manhattan and Queens Traction Corp., also grading, guttering, surfacing Queens Blvd. from Grand St. to Yellowstone Ave. and Queens Blvd. from Quentin St. to Hillside Ave., in Long Island City. Former bids rejected. Noted Apr. 18.

Ohio—See "Contracts Awarded."

Contracts Awarded

Missouri—St. Paul & Kansas City Short Line R.R., c/o Chicago, Rock Island & Pacific R.R., W. H. Peterson, ch. engr., La Salle St., Chicago, Ill., 20 mi. railroad between Coburn and point near Nettleton, to Clinch-Mitchell Constr. Co., 176 West Adams St., Chicago, Ill. Will soon take bids on 45 mi. balance new line between point near Nettleton and Birmingham.

Missouri and Arkansas—St. Louis Southwestern Ry., W. S. Hanley, ch. engr., Tyler, Tex., grading, culverts 11 mi. standard gage railroad line between Hornersville, Mo., and Leachville, Ark., to Winston Bros. Co., 410 Buder Bldg., St. Louis, Mo.; ballasting, tracks, bridges, own forces. This corrects report in July 4 issue.

New York — Erie R.R. Co., R. C. Falconer, ch. engr., 50 Church St., New York, yard expansion at Hornell, to Newhall Constr. Co., Terminal Tower, Cleveland, O., $150,000.

Ohio—Northern Ohio Power & Light Co., North Main St., Akron, replacing 920 ft. double tracks and 170 ft. single track on Tuscarawas St., between 5th and 9th Sts., in Barberton, own forces. $31,000.

Texas—Atchison, Topeka & Santa Fe Ry. Co., G. W. Harris, ch. engr., Chicago, Ill., extending 65 mi. gage railway line between San Angelo and Sonora, to Lone Star Constr. Co., Alamo Bank Bldg., San Antonio, for Kansas City, Mexico & Orient R.R. of Texas. Noted Mar. 28.

Airports

Proposed Work

Ill., Joliet—Park Bd., D. Mateer, pres., purchased 100 acres, airport, 4 mi. West on Troy Rd.

Ill., Markham — Aviation Corp., 122 East 42nd St., New York City and Garden City, L. I., preliminary plans airport development, 159th St. Kedzie and Dixie Hy. $2,000,000. Private plans.

Mo., Kansas City—City sketches by Buckley & Van Brunt, 823 Lloyd Bldg., 1-2-3 story, brick, steel circular hangar, 450 ft. diam., Air-Port Terminal. $500,000.

O., Cleveland—Cleveland Institute of Aviation, c/o F. Smith, Society for Savings Bldg., 1 story, 120 x 145 ft. hangar, 40 x 120 ft. office, concrete, brick, steel, to Gilchrist Constr. Co., Western Reserve Bldg. Est. $75,000. Noted June 20.

O., Columbus—Curtiss Flying School, Inc., 27 West 37th St., New York, W. S. Swallow, agt., 148 x 160 ft., brick, steel, concrete hangar, 30 ft. high, at Municipal Airport, to Middle States Constr. Co., 1183 Essex Ave. $100,000.

Pa., Dravosburg—Airways & Aircraft Co. of America, Farmers Bank Bldg., Pittsburgh, improving airport, incl. administration building, hangars, repair shop, Bettis Field. R. Frangbein, Madison Ave., New York, archt. J. H. Swem, engr., 106 Benedum Trees Bldg., Pittsburgh, taking bids excavation, grading. Stone & Webster, Inc., 147 Milk St., Boston, Mass., and Union Trust Bldg., Pittsburgh, supervs. engrs.

Tex., Bonham—**Chamber of Commerce, c/o** A. Crawford, mayor, airport, incl. hangars, $25,000.

Tex., Lufkin—Chamber of Commerce, airport, hangars.

Man., Winnipeg—Northwest Airways, Ltd., airport, plant. $250,000.

Bids Asked

Mass., Dartmouth—See "Contracts Awarded."

Mich., Detroit—July 17, by Dpt. P. Wks., 1 story, 200 x 1,010 ft., rein.-con., brick, steel, stone airport, concrete pile found., Gratiot St. and French Rd. $1,000,000. P. A. Fellows, city engr. Noted May 30.

Tex., Abilene—City bids about July 10, 2 story, 25 x 42 ft., brick, concrete timber terminal building, 100 x 100 ft., brick, steel hangar, concrete founds., $50,000, B. Russell Shaw, 1064 Arcade Bldg., St. Louis, Mo., engr.

Bids Received

Pa., Pittsburgh—R. G. Woodside, controller Allegheny Co., Court House, July 2, grading, draining, municipal and county airport, Lebanon Church Rd., near here, from J. W. Butler, $892,352. Noted June 27.

Contracts Awarded

Ala., Gadsden—Goodyear Tire & Rubber Co., East Market St., Akron, O., 72 x 200 ft. dirigible hangar, 75 ft. high, to Decatur Iron & Steel Co., Decatur, $50,000.

Mass., Dartmouth—E. H. R. Green, Rounds Hill, 100 x 175 ft., sheet metal hangar, 75 ft. high, concrete found., Rounds Hills Aviation Field, separate contracts.

Mo., Kansas City—Air port station, to R. G. Windrow, 912 Santa Fe Bldg., Dallas, Tex., $61,900. Est. $75,000.

Excavation, Drainage, Irrigation, Levees, River and Harbor

Proposed Work

Mississippi—Harrison Co., c/o E. McManus, Gulfport, city clk., soon takes new bids rein.-con. seawall along beach connecting end protection system, extending east from Gulfport to west end road protection system from Biloxi, 7,000 ft. long between Heartease Park and Holmhaven.

Texas — Red Bluff Water Impvt. Dist., c/o R. H. Gray, secy., Pecos, surveys irrigating 80,000 acres land in Ward, Loving, Reeves and Pecos Counties. $25,000 appropriated for preliminary surveys. $2,000,000 appropriated for irrigation. Address District Secretary.

Constr. News page 15

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OTHER PLANTS

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Excavation, Drainage, Irrigation, Levees, River and Harbor (Continued)

Tex., Port Arthur—See "Unclassified."

Bids Asked

Illinois — July 10, by Comrs. Big Slough Special Drainage District, Henry and Whiteside Counties, 110 South State St., Geneseo, removing 357,455 cu.yd. excav., from 31.3 mi. ditches between Geneseo and Prophetstown. R. M. White, Geneseo, engr.

La., Breaux Bridge—July 16, by Comrs. Coulee Nicholas Gravity D.D. 5, removing 300,000 cu.yd. earth and constructing 25 mi. drainage canals. V. E. Smith, Lafayette, engr. Noted Feb. 28.

Pa., Dravosburg—See Airports under "Proposed Work."

British Columbia—July 23, by S. E. O'Brien, secy. Dpt. P. Wks., Ottawa, Ont., dredging Courtenay River. $71,200.

Nova Scotia—July 17, by S. E. O'Brien, secy. Dpt. P. Wks., Ottawa, Ont., extending breakwater, Chegoggin Point $10,500, Meteghan $5,000, repairing wharf, seawall, Upper Port Latour $8,500.

N. S., Liverpool—July 16, by S. E. O'Brien, secy. Dpt. P. Wks., Ottawa, Ont., dredging. $30,000.

Ontario—July 24, by S. E. O'Brien, secy. Dpt. P. Wks., Ottawa, dredging Upper St. Lawrence River. $700,000.

Ont., Port Stanley—July 16, by S. E. O'Brien, secy. Dpt. P. Wks., Ottawa, extending East Sheet Pile Wall. $50,000.

Quebec—July 16, by S. E. O'Brien, secy. Dpt. P. Wks., Ottawa, Ont., dredging Ile Perrot. $15,000.

Contracts Awarded

Me., Augusta—Trustees Augusta State Hospital, dredging in Kennebec River, near Coal Wharf of hospital, to Stewart & Williams, Augusta. Est. $25,000 or more. Noted May 23.

Mass., Boston—See "Unclassified."

N. Y., New York—Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, taking down portion rubble stone retaining wall on east side New York Central R.R., at 161st St. and Fort Washington Park, to J. J. Kelley, 565 5th Ave., $8,900. Noted June 6.

Pa., Pittsburgh—See "Buildings—Commercial."

Ont., Toronto — Dpt. P. Wks., Parliament Bldgs., Ottawa, dredging in Toronto Harbor, eastern channel, to National Sand & Material Co. Ltd., Harbor Bldg., $60,000; western channel, to Great Lakes Dredging & Contg. Co., Whalen Bldg., Port Arthur, $56,000. Noted June 6 under "Ontario."

Streets and Roads

Bids Asked

Ala., Birmingham—July 16, by City Comn., curbing, guttering, sidewalks, 2 in. asphalt on 6 in. concrete paving 14 blocks 46th and 40th Places, 12th Court S. and 40th Court N., 38th and 20th Sts., 13th and 16th Aves. N., $68,856—2 in. asphalt on 6 in. concrete paving 7 blocks 49th St., 8th Terrace S., 17th Ave. N., and 21st Pl., $34,550—2 in. asphalt on 5 in. concrete paving 1 block 8th Ave. S., $3,300—concrete sidewalks, curbing, guttering, 2 in. asphalt on 5 in. concrete paving 5 blocks 34th Ave. N., 38th Pl., 39th Court N., $28,000—7 in. concrete paving 200 ft. Vanderbilt Rd., 300 ft. 6th Alley S., 200 lin.ft. 3rd Ave. S., 15 blocks 12th Ave. N., Vanderbilt Rd., 6th Court Alley, 2nd Alley, and 9th Alley N. $49,075. A. J. Hawkins, city engr.

Arkansas—July 18, by State Hy. Comn., Little Rock, grading 9 mi. Job 10110, Poinsett Co., $40,000—graveling 14.5 mi. Job 7113, Columbia Co., $40,000—7 mi. Job 839, Johnson Co., $60,000—10 mi. Job 454, Franklin Co., $90,000—8.5 mi. Job 398, Clark Co., $50,000—6 mi. Job 366, Clark Co., $40,000—6 1/3 mi. Job 127, Woodruff Co., $70,000—18,301 cu.yd. Job 195, Lee Co.—gravel, crushed stone surfacing 13 mi. Job 993, Boone and Newton Counties, $30,000—concrete paving 5.5 mi. Job 879, Loan Co., $90,000—11 mi. Job 877, Logan Co., $210,000—asphalt paving 9 mi. Job 1079, Craighead Co., $120,000. C. S. Christian, Little Rock, hy. engr.

California—July 24, by State Hy. Comn., Sacramento, grading, oil treated crushed gravel or stone surfacing 9.8 mi. Inyo Co.; 13 mi. San Bernardino Co. C. H. Purcell, Sacramento, engr.

Calif., Santa Monica—July 18, by City Council, grading, 6 in. warrenite paving 107,576 sq.ft., and 6 in. asphaltic concrete paving 397,435 sq.ft., Broadway St. To exceed $300,000. H. B. Carter, city engr.

Ind., Anderson—July 15, by Comrs. Madison Co., curbing, sewers, concrete paving 7/8 mi. Woolums Rd. $38,000—½ mi. Gaus Rd. $28,000. M. A. Steele, Court House, engr.

Ind., Logansport—July 15, by Bd. Comrs. Cass Co., improving County Unit Rd. 7, $72,600. M. Flary, aud.

Ind., South Bend—July 22, by Comrs. St. Joseph Co., constructing Fillmore Rd., $23,800—graveling Fillmore Rd., Penn Twp., $48,300—Fillmore Rd., Portage Twp., $38,000—Fillmore Rd., Penn Twp., $54,800. F. P. Crowe, co. aud.

Ind., Valparaiso—July 20, by Comrs. Porter Co., constructing 1.457 mi. W. C. Hackett et al Rd. $34,363. C. A. Blachly, co. aud.

Ia., Creston — July 17, by B. Tallman, city clk., concrete, asphaltic concrete, sheet asphalt or brick paving 20,000 sq.yd. and repaving 40,000 sq.yd. P. K. DeVoe, city engr.

Ia., Des Moines—July 15, at office Auditor Polk Co., graveling 20.25 mi. roads. F. O. Laing, Des Moines, co. engr.

Ia., Emmetsburg—July 15, at office Auditor Palo Alto Co., graveling 20 mi. roads. T. R. Martin, Emmetsburg, co. engr.

Ia., Marshalltown—July 15, by A. McMahon, city clk., Warrenite bitulithic, sheet asphalt or 7 in. concrete paving 30,000 sq.yd. Brown & Cook, 108 North Market St., Ottumwa, engrs.

Ia., Marshalltown—July 16, at office Auditor Marshall Co., graveling or crushed rock resurfacing 30.6 mi. roads; graveling 0.88 mi. new road. D. C. Elder, Marshalltown, co. engr.

Ia., Montezuma—July 16, at office Auditor Poweshiek Co., graveling or crushed rock surfacing 13.5 mi. Brooklyn-Hartwick Rd. C. E. Olson, Montezuma, co. engr.

Ia., Primghar—July 16, at office Auditor O'Brien Co., graveling 24.35 mi. secondary roads; resurfacing 4 mi. township roads. W. L. Anderson, Primghar, co. engr.

Kentucky—July 31, by State Hy. Dpt., Frankfort, surfacing 8.5 mi. Greensburg Hodgenville Rd., F.A.P. 126-A.S., Green Co.—delivering stone for retread on 1.4 mi. Jackson Hy., S.P. 3-H.1—9.811 mi. S.P.3-G-1, Hart Co. J. S. Watkins, hy. engr.

Kentucky—July 31, by State Hy. Dpt., Frankfort, surfacing 4.6 mi. Florence-Warsaw Rd., F.A. 168-D S.Boone Co.; 0.557 mi. Ft. Thomas Rd., S.P. 21-B S, Campbell Co. J. S. Watkins, hy. engr.

Louisiana—July 30, by State Hy. Comn. Baton Rouge, concrete paving 69.39 mi. hys. in St. Landry, Franklin, Calcasieu, Jefferson Davis, Winn, Beauregard, Vernon, Rapides, Bienville, Lincoln, Washington Parishes. O. K. Allen, hy. comr.; adv. E. N.-R. July 11.

Maine—July 17, by State Hy. Comn., Augusta, bituminous macadam surfacing 1 mi. Presque Isle—gravel surfacing 4.22 mi. Federal Aid Project 124-A, Moscow—grading 1.09 mi. Hermon—0.74 mi. Warren-Thomaston. L. D. Barrows, ch. engr. hy. comn.

Maryland—July 16, by State Roads Comn., Baltimore, graveling 1.5 mi. Contr. AA-62, Anne Arundel Co.—3 mi. Contr. P-93, Prince George Co.—concrete paving 6 mi. Contr. AA-68, Anne Arundel and Calvert Counties—3.93 mi. Contr. K-34, Kent Co.—macadam resurfacing 1 mi. Contr. M-126, Montgomery Co.—concrete shoulders on 9 mi. Contr. W-1-E, Washington Co. G. C. Uhl, chn.; adv. E. N.-R. July 11.

Massachusetts — July 16, by Dpt. P. Wks., Boston, bituminous macadam paving 6,450 ft. hy. in Canton and Sutton; rein.-con. paving 17,234 ft. hy. in North Andover and Milford. A. W. Dean, engr.

Massachusetts—July 16, by Dpt. P. Wks., Boston, rein.-con. and granite block paving 3,388 ft. hy., also widening bridge over Shawsheen River, Andover. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Boston—July 12, by Dpt. P. Wks., sheet asphalt or bitulithic paving, Ward 20. $25,000 or more. J. H. Sullivan, comr.

Mass., Boston—July 15, by Dpt. P. Wks., granite block paving Braitts and Pitts Sts., Ward 3. $25,000. J. H. Sullivan, comr.

Mass., Boston — July 17, by Dpt. P. Wks., sheet asphalt or bitulithic paving Brayton Rd. Ward 22, Vinal St. Ward 21. $25,000 or more. J. H. Sullivan, comr.

Mass., Gloucester—See "Contracts Awarded."

Mass., Newton—July 10, by Street Comrs., City Hall, bituminous macadam, sheet asphalt paving Contrs. 22006 to 22009 (inclusive). To exceed $25,000. W. P. Morse, city engr.

Minn., St. Paul—July 16, by K. L. Pieseler, city purch. agt., paving St. Clair St. between Osceola and Snelling Aves. $75,000. J. W. Kelsey, city engr.

Minn., Winona—July 15, by G. W. Hofmann, city recdr., paving 10,862 sq.yd. Sarnia St. $35,000. E. E. Chadwick, city engr.

Mo., Clayton—July 17, by St. Louis Co. Court House, grading, macadam paving Bayless Ave. between Lemay and Union Rds.; Weber Rd. between Union Rd. and Gravois St. R. Jablonsky, Court House, engr.

Mo., St. Louis—July 30, by Bd. P. Serv., City Hall, 20 ft. concrete slab paving 10,500 sq.yd. Kingshighway. $32,200—vibrolithic concrete paving 750 sq.yd. Hudler St., $3,960—amiesite paving 2,470 sq.yd. Lee St., $21,280—asphalt paving 3,555 sq.yd. Kansas St. $23,760—asphaltic concrete paving 960 sq.yd. French Court. $5,920—warrenite paving 6,315 sq.yd. Penrod St. $41,209; 9,550 sq.yd. Warne St. $67,400; 14,945 sq.yd. Bates St. $86,640—concrete sidewalks in various parts city $6,098. W. W. Horner, city engr.

Mo., St. Louis—July 30, by Bd. P. Serv., City Hall grading, curbing, amiesite on concrete paving 3,660 sq.yd. Fyler Ave., $31,920; also 1 story, brick, concrete building for pipe yard of Water Dpt., $15,000. W. W. Horner, City Hall, engr.

Nebraska—July 18, by State Dpt. P. Wks., Lincoln, oiled sand surfacing 100,176 sq.yd. O'Neill-Bartlett Project 313-A, grading 10,600 cu.yd. Project 237-C. R. L. Cochran, state hy. engr.

Neb., Ord—July 16, by N. Wolters, city clk., alternate types paving 4,600 sq.yd. Paving Dist. 4 (19th, 20th and P Sts.) $26,308 on 3 in. brick. Henningson Eng. Co., 326 Union State Bank Bldg., Omaha, engrs.

New Jersey—July 22, by State Hy. Comn., Trenton, grading, 8 in. concrete paving 129,936 sq.yd. Route 42, Sects. 1 and 2, Williamstown to Atlantic Co. line, Gloucester Co. A. L. Grover, ch. clk.

N. J., East Brunswick — July 17, by East Brunswick Twp., concrete paving 17,890 sq.yd. Herberts Corner-Dunham's Corner Rd. $70,000. R. P. Wilson, 46 Paterson St., New Brunswick, engr.

N. J., New Brunswick—July 16, by City Comrs., City Hall, sheet asphalt paving. $141,000. A. Atkinson, city engr.

N. J., Ringoes — July 20, by East Amwell Twp., grading, macadam paving 2.1 mi. Ringoes-Sergeantville Rd., Sect. 1, 16 ft. G. Davis, White House Station, twp. engr. Noted Feb. 7.

N. J., Robbinsville—July 16, by West Windsor Twp., bituminous macadam paving 6,250 sq.yd. Edinburg-Robbinsville Rd. A. D. Bullock, 128 West State St., Trenton, engr.

N. J., Sayreville — July 18, by Bd. Freeholders Middlesex Co., Court House, rein.-con. paving Bordentown Turnpike. $25,000. W. F. Buchanan, 175 Smith St., New Brunswick, co. engr. Noted Jan. 17.

N. J., Union—July 18, by Twp. Com., Union High School, grading, 7 in. concrete paving Laurel Ave. from Burnet Ave. to Essex Co. line. $30,000. H. Kreh, Jr., Falls Bldg., twp. engr.

N. J., West Windsor (mail Windsor)—July 16, by Washington Twp. Com., improving 10,700 sq.yd. Edinburg-Robbinsville Rd., 18 ft.

New Mexico—July 17, by State Hy. Comn., Santa Fe, grading, bridging, graveling 23,000 cu.yd. F. A. P. 128-7, Quay Co. $100,000—127,000 cu.yd. F.A.P. 151-B, Bernalillo Co. $50,000—25,000 cu.yd. F.A.P. 132-B, Eddy Co. $250,000—18,000 cu.yd. F.A.P. 169-B, Luna Co. $100,000. W. C. Davidson, hy. engr.

New Mexico—State Hy. Comn., Santa Fe, bids about July 15 graveling 10.672 mi. Federal Aid Project 162-B, Chaves Co., 26 ft.—14.121 mi. Federal Aid Project 132-A, Eddy Co., 26 ft. W. C. Davidson, state hy. engr.

N. Y., Brooklyn—July 17, by J. J. Byrne, pres. Brooklyn Boro. Boro Hall, grading, curbing, flagging, Farragut Rd., Avenue L, Flatlands and 14th Aves., East 55th, Stuart, Vermont Sts.; grading, sheet asphalt on concrete paving Avenues L and U, Farragut and Rutland Rds., Bay 40th, East 52nd, East 55th, Fenimore, East New York, and 13th Aves.

N. Y., Buffalo — July 16, by Bd. Supervs. Erie Co., County Hall, heaving foundation paving approaches to Bridge Project 22, Concord. G. Diehl, Ellicott Sq., co. engr.

N. Y., Buffalo—July 18, by G. Fisk, comr. P. Wks., Municipal Bldg., paving Bailey Ave., Oschawa and Latour Sts.; repaving Gelston and French Sts. Former bids rejected. C. E. P. Babcock, city engr. Noted June 13.

N. Y., New York — July 17, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading, curbing, sidewalks Kimberbly Pl.; grading, sidewalks, sheet asphalt on concrete paving Casanova and East 174th Sts., Riverdale, Whitlock, Harrod Aves.

N. Y., St. George—July 17, by J. A. Lynch, pres. Richmond Boro, Boro Hall, granite block repaving Bway.—concrete sidewalk on Targee St.—sewer in Bryant Ave.

North Carolina—July 16, by State Hy. Comn., Raleigh, (**P. means Project**), clearing, grubbing, grading 14.59 mi. P. 2050, Craven Co., $69,500—9.16 mi. P. 7770 and grading, topsoiling 10.6 mi. P. 7771 Wilkes Co., $178,900 and $68,900 respectively—7.24 mi. P. 827, Cleveland Co., $43,800 — grading, concrete or asphalt paving 5.97 mi. P. 6330 Gaston Co., $145,500—10.12 mi. P. 6890 and 6.34 mi. P. 6880, Stanley Co., $188,300 and $137,700 respectively—9.24 mi. P. 1021 Beaufort Co., $179,200. J. D. Waldrop, Raleigh, engr.

N. D., Mandan—July 17, by W. H. Seitz, city aud., grading, curbing, paving 14 blocks in East End. $50,000. E. R. Griffin, city engr. Noted June 13.

Oklahoma—July 16, by State Hy. Dpt., Oklahoma City, concrete paving 6.383 mi. U. S. Rd. 81, F.A.P. 124, Kingfisher Co.—3.99 mi. S.H. 3, F.A.P. 211, and 4.69 mi. S.H. 18, F.A.P. 221, Pottawattomie Co. — 5.63 mi. U. S. Rd. 81, F.A.P. 223, Grant Co.—5 mi. S.H. 11, S.A.P. 422, Kay Co.—6 mi. U. S. Rd. 64, F.A.P. 224, Alfalfa Co. J. F. Rightmire, acting hy. engr.

Okla., Okemah—July 15, by T. D. Thomas, city clk., concrete paving 9,400 sq.yd. alleys. Columbia St. $28,117. Long & Co., 1300 Colcord Bldg., Oklahoma City, engrs.

Pa., Conapolis—July 12, by W. E. Cain, boro secy., grading, curbing, brick or concrete paving George Ave. between Bine St. and 2nd Ave., Bway Ave. between Fleming Ave. and Mulberry St. $25,000. E. Cooper, Berger Bldg., Pittsburgh, boro engr.

Pa., Phila.—July 16, by Dpt. P. Wks., Bureau Hys., A. Murdock, dir., City Hall Annex, Schedule A, improving City Avenue, Neill Dr.,—

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Streets and Roads (Continued)

Schedule B, asphalt paving (assessment work) Orthodox St.—Schedule C, asphalt repaving Tasker St.—Schedule E, fabricated structural steel for Spring Garden Street Bridge 12 over Schuylkill River (over Pennsylvania R.R. Span 1).

Tennessee—Aug. 2, by State Dept. Hys. & P. Wks., Nashville, paving 65.754 mi. roads in Lawrence, Wayne, Marion, McNairy, Hardeman, Lawrence and Giles Counties—grading 52.681 mi. roads in Weakley, Cumberland, Clay and Hardeman Counties—bridges in Wayne, De Kalb and Shelby Counties. R. H. Baker, hy. comr.; adv. E. N.-R. July 11.

Tex., Jacksonville — July 16, by City, c/o Secretary, vibrolithic concrete, natural limestone, rock asphalt, duraco or other prepared rock asphalts or bitulithic paving 45,000 sq.yd., also 4,000 ft. sewers. H. L. Thackwell, Jacksonville, consult. engr.

Wisconsin—July 17, by State and Marathon Co. Hy. Comns., Court House, Wausau, grading, concrete paving 64,556 sq.yd. State Aid Project 4504, S.T.H. 97. W. C. Buetow, state hy. engr.

Wis., Milwaukee—July 18, by W. J. Cory, clk. Milwaukee Co., grading concrete paving 30,800 sq.yd. Grange Ave.—resurfacing 17,000 sq.yd. Green Bay Rd. 2—grade separation Rawson Ave. 1, incl. 44,000 cu.yd. excav. W. Cavanaugh, Milwaukee, co. hy. comr.

Ont., Durham—July 12, by R. C. McKnight, engr., Court House, Owen Sound, grading, tile underdrainage, concrete paving 5,700 sq.yd. Grey Co. roads. $25,000-$30,000.

Ont., Owen Sound—See "Contracts Awarded."

Ont., Port Hope—J. W. Sanders, clk., taking bids concrete curbing, guttering, sheet asphalt, concrete or bitulithic paving 16,000 sq.yd. $55,000. M. U. Ferguson, Town Hall, engr.

Ont., Toronto—July 16, by S. McBride, mayor, asphalt on concrete paving Gerrard St. and 8 avenues—bitulithic on concrete paving Merton St. and Roehampton Ave.—grading Melita Ave. —concrete sidewalk on Chaplin Crescent, Gerrard and Pendrith Sts., 4 avenues Highbourne and Killarney Rds. $1,000,000. R. C. Harris, City Hall, engr.

Ont., Toronto—See "Contracts Awarded."

Bids Received

Pa., Pittsburgh—Comrs. Allegheny Co., Court House, July 2, improving Ohio River Blvd., incl. 9 bridges, from Booth & Flinn, Forbes Bldg., $3,344,848. Est. $3,500,000. Noted June 27.

Contracts Awarded

Arizona—State Hy. Comn., Phoenix, grading 17,229 cu.yd. F.A.P. 7, to F. D. Shufflebarger, Albuquerque, N. M., $68,293—11,334 cu.yd. F.A.P. 93-B, to J. Mulligan, San Carlos, $85,414 —Phoenix-Yuma Hy., to Packard & Tanner, 914 West Willetta St., Phoenix, $105,284. Grand total $258,991.

California—State Hy. Comn., Sacramento, grading, paving 3.9 mi. San Diego Co., to Basich Bros., 3788 South Vermont St., Los Angeles, $186,446—grading, surfacing 5.2 mi. San Luis Obispo Co., to A. Teichert & Son, 1846 37th St., Sacramento, $76,777, both 20 ft. wide. Noted June 6.

Calif., Atherton—Town Trustees, asphaltic concrete paving Middlefield Rd., to Peninsula Paving Co., Standard Oil Bldg., San Francisco, $35,937. Noted June 20.

Calif., Concord—Grading, vitr. sewers, asphaltic macadam on waterbound macadam paving, to Hutchinson Co., 1450 Harrison St., San Francisco, $37,820. Noted Mar. 28.

Calif., San Bernardino—Curbing, walks, 5 in. concrete paving 91,000 sq.ft. Edgehill Rd., to A. W. Gardner, 45 East Cypress St., Redlands, $17,545.

Calif., San Bernardino — Curbing, walks, asphaltic concrete paving 270,000 sq.ft. Broadmoor Blvd., to Hall-Johnson Co., 905 Westminister St., Alhambra, $66,555.

Calif., San Diego—Common Council, curbing, grading, sewers, 6 in. concrete paving 51st and 52nd Sts., to R. E. Hazard Constr. Co., 2548 Kettner Blvd., $26,486. Noted May 30.

Calif., San Diego—Common Council, curbing, 5 in. asphaltic concrete paving 36,200 sq.yd. Parade Ground and streets in Marine Base, to V. R. Dennis Constr. Co., 3911 5th Ave., $49,990.

Calif., San Diego—Common Council, curbing, 6 in. asphaltic concrete paving 199,916 sq.ft. Florida St., to Griffith Co., 1308 Newton Ave., $48,538. Noted June 6.

Calif., San Diego—San Diego Co., curbing, guttering, asphaltic macadam paving 3,959 sq.yd. streets in unincorporated town of Encinotas, to Miracle Constr. Co., 4751 Monroe St., $79,416.

Calif., Santa Cruz.—Santa Cruz Co., grading, vitr. sewers, septic tank, pumping plant and equipment, macadam paving streets in Rio Del Mar, to Granite Constr Co., Watsonville, $290,740.

Calif., Tujunga—City Council, grading, curbing, walks, lighting system, 6 in. concrete paving 179,936 sq.ft. Michigan Ave., to L. B. Konjevod, C. H. Frost Bldg., Los Angeles, $55,617. Noted June 6.

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Conn., Meriden—C. P. Prann, engr., City Hall, bituminous macadam paving Bunker Ave., Warren and Cross Sts., to Robison & Powers, Inc., 35 Colony St., $30,850. Est. $50,000.

D. C., Wash.—District Comrs., District Bldg., grading 15,000 cu.yd., to Latimer & Maloney, 17th and Holly Sts. N.W., repairing sidewalks, to Cranford Co., 2620 E St. N.W., $161,415.

Ga., Augusta—For 6 in. concrete paving, to W. F. Bowe, Jr., Augusta, $62,000.

Ill., Belleville—Rein.-con. paving 85th, 86th, 87th and 88th Sts., and sewers in 85th, 86th and 88th Dists., to Hoeffken Bros. Supply & Constr. Co., 222 West B St., $26,028 and $7,667 respectively. Noted Feb. 7.

Ill., Bloomington—McLean Co. graveling 32.5 mi. township roads, to W. M. Rowe, McLean, and to W. Rowe, Saybrook, at $0.83 per cu.yd., total $41,500. Est. $65,000. Noted Apr. 4.

Ill., Chicago—Bd. Local Impvts., City Hall, removing present paving, asphalt on concrete and 4 in. granite block repaving, widening, grading, curbing, guttering, sewers asphalt on 8 in. concrete paving sections North Ashland Ave., to White Paving Co., 1735 Fullerton Ave.; grading, curbing, guttering, sewers, 10 in. concrete paving Peterson Ave., to Chicago Constr. Co., 228 North La Salle St.

Ill., Chicago—Bd. Local Impvts., City Hall, 6 ft. concrete sidewalks on one or both sides 12 streets and avenues, to Banner Constr. Co., 384 North Harding Ave.—39, to G. Kehl Sons, 1225 North Maplewood Ave.—12, to G. Thomas —22, to Siewert-Callsen Co., 3865 Milwaukee Ave.—8, to Aldrich Constr. Co., 140 South Dearborn St.—6, to Superior Constr. Co., 1109 East 52nd St.—6, to Simpson Constr. Co., 120 South La Salle St.—4, to M. Schuh, 4625 Dickson Ave.—1 avenue, to O. E. Brooks & Son, 6238 North West Hy. Noted May 23.

Ill., Chicago—Cook Co. Comn., 139 North Clark St., paving Riegle Rd., to States Impvt. Co., 160 North La Salle St., $136,974—Oakton St., to S. Jaicks, 1024 North Blvd., Oak Park, $8,653—183rd St., to S. Gottschalk, Homewood, $21,100—17th Ave., to Carey & Kelley Co., $36,485. Grand total $203,212.

Ill., Collinsville—Grading, curbing, concrete paving Burroughs, Aurora, Johnson and Harrison Sts., to J. Kesl & Son, Edwardsville, $26,916. Noted Mar. 21.

Ill., East St. Louis—Concrete paving Natalia, 46th and 62nd Sts., to Moore Bros. Constr. Co., 2000 St. Clair Ave., $39,840; Gross Ave., 14th and Belleview Sts., to Keeley Bros. Contg. Co., 4300 State St., $54,780. Noted Apr. 18.

Ill., Forrest—Livingston Co., graveling 6 mi. township roads, to Churchill Gravel Co., Fairbury, $15,771, 17 mi., to Western Sand & Gravel Co., Spring Valley, $49,087 Est. $70,000.

Ill., Tesuville — Paving Keeler and Morse Aves., to Arcole Constr. Co., Evanston, $17,111; sewer and water stubs, to J. Bellini, 822 South Loomis St., Chicago, $23,000.

Indiana—State Hy. Comn., Indianapolis, improving 9.355 mi. Rd. 3, Henry Co. to G. A. Ammerman & Son, Indianapolis, $162,485 est. $194,664—6.043 mi. Rd. 37, Monroe Co., to Buskirk & Dodds Co. Bloomington, $107,219 est. $109,564. Noted June 20.

Ind., Bloomington—Bd. Wks., concrete paving 2nd St., to Kerr & Murphy, Bloomington, $49,700.

Ind., Crown Point—Lake Co., constructing Simpson Rd., to Wm. Prohl, Hammond, $15,794—Lund Rd., to C. C. Shearer, Hobart, $17,850—Tyler Rd., to W. F. Black, Lowell, $27,690. Grand total $61,334. Noted May 30.

Ind., Crown Point—Lake Co., concrete paving Rufus East Rd., to A. L. Courtright Constr. Co., Gary, $60,500. Noted June 13.

Ind., Indianapolis—Marion Co., constructing Millersville Rd., to J. R. Hiatt, 3604 West 10th St., $89,163. Noted May 30.

Ind., Lafayette—Tippecanoe Co., concrete paving Main St., to F. J. Vester, Lafayette, $31,710.

Ind., South Bend—St. Joseph Co., concrete paving Elm Rd., to S. S. Palma, Lafayette, $47,746—graveling Riddles Rd., to Sarver & Sons, Leiters Ford, $44,690—New Rd., to Carey-Tombaugh-Carey, Macy, $69,889—Lehman Rd., to C. D. Smelzer, $17,744. Grand total $180,069. Noted June 13.

Ia., Algona—Kossuth Co., graveling sections roads, to Van, Van & Huff, Armstrong, $44,362.

Ia., Algona—Kossuth Co., graveling roads, to Van & Van and J. Huff, Armstrong, $70,000.

Ia., Alta—F. N. Sipe, city clk., curbing, guttering, concrete paving 14,500 sq.yd., to Hansen & Wesley, $32,518. Est. $65,000. Noted June 20.

Ia., Boone — Boone Co., maintenance graveling sections 56 mi. county and township roads, to Nelson & Melohn, Nevada $7,975—to J. R. Paul, Jefferson $9,345—to J. H. Hartwell, Early $11,572—to H. Eldridge, Clemons $8,294—to D. Paul, Ft. Dodge $3,860—to R. Cook, Nevada $13,317—to H. Moody, Perry $4,138. Grand total 58,499. Noted May 16.

Ia., Clinton—Clinton Co., grading 13.88 mi. road, to Foley Bros., Anamosa, $42,424.

Ia., Corning—Adams Co., paving 10.129 mi. U. S. Rd. 34, Federal Aid Projects 26 and 152, to Western Asphalt Paving Co., 2100 East 4th St., Sioux City, $311,703.

Ia., Fairfield—Grading, 6 in. rein.-con. paving 8,672 sq.yd. incl. 6 catch basins, to C. H. Kearns, Fairfield, $19,000.

Ia., Le Mars—Plymouth Co., grading 10 mi. road, to G. W. Condon, 415 Farnum St., Omaha, Neb., $25,280—2 I-beam bridges, to Humphrey & Son, Cherokee, $6,300—32 culverts, to Christesen Bros., Tyler, Minn., $9,000. Grand total $50,580.

Ia., Monona—To Bemis & Schlick, 503 Southern Surety Bldg., Des Moines, 19,690 sq.yd. 7 in. rein.-con. paving at $1.87 per sq.yd., 14,632 ft. curbing, guttering $0.59, 3,000 cu.yd. excav. $0.60. Est. $65,000. Noted June 6.

Ia., Osage—Grading, curbing, guttering, vibrolithic concrete paving 17,080 sq.yd. East Main and North 7th Sts., to Booth & Olson, Sioux City, $42,574; 6,114 ft. 12- to 33-in. vitr. clay storm sewers, to D. Christianson, Rockwell, $15,291. Noted May 9.

Ia., Osceola—Clark Co., paving 10.384 mi. U. S. Rd. 34, Project 313, to W. O'Neill Sons, Faribault, Minn., $293,128.

Ia., Ottumwa—Wapello Co., paving 7.289 mi. U. S. Rd. 63, Project 42, to McCarthy Impvt. Co., Kahl Bldg., Davenport, $202,240.

Kan., Paola — Miami Co., grading 9 mi. Burgess Rd., 28 ft., to Botsford & Reed, 650 West 69th St., Terrace, Kansas City, Mo., $33,693. Noted June 13.

Kan., Topeka—For 2 in. on 7 in. asphaltic concrete paving 33,371 sq.yd., to Kaw Paving Co., 100 Topeka St., $153,685. Noted June 13.

Maryland—State Roads Comn., Baltimore, concrete shoulders on 7 mi. Allegany Co., to Thomas, Bennett & Hunter, Westminster, $71,649—concrete paving 0.93 mi. Washington Co., to Cumberland Contg. Co., Cumberland, $21,998 —0.9 mi. Prince George Co., to Southern Maryland Contg. Co., 14 East Lexington St., Baltimore, $23,510. Grand total $117,157. Noted June 13.

Md., Baltimore—Bd. Awards, grading 12,600 sq.yd. Contr. 526, to T. Bresnan & Sons, 2018 West North Ave., $25,023; sheet asphalt paving Contr. 527, to Amer. Paving & Contg. Co., 1320 North Monroe St., $50,196. Noted June 13.

Md., Towson—Baltimore Co. grading 1.38 mi. Group 13, to T. B. Gatch & Sons, Overlea, Baltimore, $30,072.

Md., Towson—Baltimore Co., concrete paving 1.42 mi. Group 12, to J. A. Lavezza, 911 Eastern Ave., Baltimore, $45,620. Noted June 13.

Massachusetts—Dpt. P. Wks., bituminous macadam paving 7,450 ft. hy. Stoneham and Winchester, to Ramo & Penakio Co., 69 Edwards Court, Lynn, $63,865; 5,220 ft. Holbrook, to Powers Bros., 161 Montello St., Brockton, $32,504. Noted June 20.

Mass., Boston—Park Dpt., 33 Beacon St., bituminous macadam paving Commonwealth Ave., North Dr., to National Constr. Co., 161 Summer St. $29,813. Noted June 27.

Mass., Boston—Dpt. P. Wks., sheet asphalt or bitulithic paving Morton St., to M. F. Gaddis, 6 Beacon St., $69,928. Noted June 20.

Mass., Brookline—Paving Carlton St. extension, to University Excavating Co., 38 Sacramont St., Cambridge. Est. exceeds $25,000.

Mass,, Brookline (br. Boston)—Sheet asphalt paving Winchester St., to A. A. Doyle, 44 Perkins St., Jamaica Plain, $18,950. Est. $25,000.

Mass., Gloucester—Sheet asphalt, bituminous macadam paving, separate contracts. $200,000.

Michigan—E. R. Benkert, resident engr., Port Huron, macadam waterbound surface treating 2.178 mi. M079-5, C-2, 20 ft., Tuscola Co., to James Bright, Pigeon, for State Hy. Dpt., Lansing, $37,449 incl. cement. Noted June 6.

Michigan—C. L. Cowgill, resident engr., Plymouth, concrete paving 10.294 mi. F063-21, C-1, 20 and 40 ft., Oakland Co., to R. D. Baker, Royal Oak and Outer Dr., Detroit, for State Hy. Dpt., Lansing, $310,255 incl. cement. Noted May 23.

Michigan—E. D. Crandall, resident engr., Cadillac, concrete paving 4.876 mi. F083-5, C-2, 20 ft., Wexford Co., to L. W. Edison, Grand Rapids, for State Hy. Dpt., Lansing, $120,514 incl. cement. Noted May 23.

Michigan—E. D. Crandall, resident engr., Cadillac, concrete paving 5.984 mi F067-6, C-3, 20 ft, Oscelo Co., to K. B. Olson, Holland, for State Hy. Dpt., Lansing, $165,080 incl. cement. Noted May 23.

Michigan—H. C. Fleming, resident engr., Grand Rapids, concrete paving 7.614 mi. M062-23, C-1, 20 ft., Newaygo Co., to Hersey Gravel Co., Hersey, for State Hy. Dpt., Lansing, $270,296 incl. cement. Noted June 6.

Michigan—H. C. Fleming, resident engr., Grand Rapids, concrete paving 2.494 mi. M041-40, C-1, 20 ft., Kent Co., to Scharl Constr. Co., Grand Rapids, for State Hy. Dpt., Lansing, $100,529 incl. cement. Noted May 23.

Michigan—G. H. Greene, resident engr., Alpena, concrete paving 1.552 mi. M069-8, C-1, 20 ft., Otsego Co., to L. Perry, Beaverton, for State Hy. Dpt., Lansing, $45,200 incl. cement. Noted May 30.

Michigan—G. H. Greene, resident engr., Alpena, two course graveling 1.541 mi. M016-12, C-2, 20 ft., Cheboygan Co., to Peterson Constr. Co., 502 Globe Bldg., Minneapolis, Minn., $31,209 incl. cement; 1.271 mi. M016-12, C-1, to Goldberg Constr. Co., Mackinaw City, $62,770 incl. cement, for State Hy. Dpt., Lansing. Noted May 30.

Michigan—R. R. Havens, resident engr., Jackson, concrete paving 1.347 mi. M038-15, C-1, 20 ft., Jackson Co., to Mollering Constr. Co., Coldwater, for State Hy. Dpt., Lansing, $63,621 incl. cement. Noted May 9.

Streets and Roads (Continued)

Mich., Dearborn — Concrete paving 31,000 sq.yd. Mulkey St., to Otis Cement Constr. Co., 2956 Penobscot Bldg., Detroit, $80,000. Noted Apr. 18.

Mich., Detroit—Stone or concrete curbing, 3½ in. sheet asphalt on 8 in. concrete paving Bringard Dr. and 12 avenues, to Detroit Asphalt Paving Co., 909 Transportation Bldg., $370,638—4 avenues, to Cooke Asphalt Paving Co., 1216 Penobscot Bldg., $126,874—Mt. Elliott Ave., to Cleveland Trinidad Paving Co., 715 Hammond Bldg., $12,511. Grand total $510,023.

Mich., Grand Rapids—Kent Co. Road Office, graveling 2 mi. Spring Lake Rd., Solon Twp., to Gould & Cross, Grand Rapids, $31,600.

Mich., Muskegon—I. L. Christiansen, city clk., concrete paving 400 ft. Bauer Ave., and widening concrete paving Peck St., to R. J. Buck, 813 Reed St., Kalamazoo, $4,445 and $35,106 respectively.

Mich., Pontiac—Concrete curbing, guttering, rein.-con. paving 31,000 sq.yd., to Bartling & Dull, Dixie Hy.

Mich., Saginaw — Rein.-con. paving 53,000 sq.yd. Spalding Twp. Assessment Dist. 130, to R. R. Scott Co., Baringer Bldg., $178,192.

Mich., Zeeland—Concrete paving 13,000 sq.yd. Elm and State Sts., to K. B. Olsen Co., Holland. Est. $30,000.

Minnesota—State Hy. Comn., St. Paul, grading, 338,000 cu.yd. S.P. 1-53, F. A. P. 121, to M. Wunderlich, 1221 Blair St., St. Paul, $92,479—424,000 cu.yd. S.P. 5-53, Sect. 1, F.A.P. 347-D, to T. J. Friederick, 610 Globe Bldg., Minneapolis $100,772—152,000 cu.yd. S.P. 56-24, Sect. 2, to Stevens Bros., 612 Endicott Bldg., St. Paul, $50,184—139,000 cu.yd. S.P. 66-21, Sect. 2, to Lobnitz Bros., Olivia $29,523. Grand total $272,958. Noted June 13.

Miss., Holly Springs—Grading, curbing, guttering sidewalks, concrete paving, 6,850 sq.yd. Randolph and South Memphis Sts., to J. P. Rowan, Holly Springs, $16,743.

Mo., Independence—Jackson Co., asphaltic concrete paving Woodland Ave. between 87th St. and city limits, to McTernan Halpin Constr. Co., Swope Parkway & South Benton St., Kansas City, $22,138. Est. $25,000.

Mo., Joplin—To Granite Bituminous Paving Co., Ry. Exch. Bldg., St. Louis, warrenite bitulithic paving Joplin St. between 6th and 10th Sts. $12,700—to V. E. Koch, 417½ Joplin St., concrete paving Laurel Rd., Roanoke Crest Subdivision $1,102; Crest Dr. between Kensington and Manitou Rds. $10,048; curbing, guttering same road $2,419; Pennsylvania Ave. between 26th and 27th Sts. at $0.79 per ft.; Crest Dr. and Laurel Rd. $2,949.

Mo., Marshall — City Council, to Hannibal Contg. Co., Hannibal, 6 in. rein.-con. paving 7,560 sq.yd. at $2.03 and $2.07 per sq.yd., 3,955 ft. integral curbing $0.27, 2,020 cu.yd. grading $0.65—to Bertman & Menefee, Sedalia, 56,000 sq.yd. asphalt mat coat resurfacing $0.215 per sq.yd. Noted June 13.

Mo., Maryville—C. H. Westfall, city clk., 7 in. rein.-con. paving 9,080 sq.yd. 9th, 5th, 7th, 11th and Davis Sts., to Cook-O'Brien Constr. Co., 430 Ry. Exch. Bldg., Kansas City, $28,809. Est. $25,000.

Mo., St. Joseph—To Koch & Bridgeford, St. Joseph, 8 in. rein.-con. paving 8,380 sq.yd. Frederick Ave. $26,330; 6 in. rein.-con. repaving 9th St. between Pacific and Hickory Sts. $6,847; 6 in. rein.-con. paving Beattie St. between 18th and 19th Sts. $3,687; 1 alley, $1,238. Grand total $38,102.

Mo., St. Joseph—Bd. P. Wks., to Sayles Constr. Co., St. Joseph, 6 in. concrete paving 8th St. between Mitchell and Hickory Sts. $23,942—to O. H. Schmidt, 112 North 9th St. 2,010 sq.yd. 4th St. $6,000—to Land Constr. Co., 1016 Corby Bldg., 6 in. concrete paving 3,469 sq.yd., 2 in. asphalt paving 2,762 sq.yd. streets $13,313; 2 in. asphaltic concrete paving 1,250 sq.yd. 8th St. $2,307—to Consolidated Paving & Material Co., 7th and Olive Sts., concrete paving 1,169 sq.yd. 2 alleys $4,407—to P. P. Young, 4902 St. Joseph Ave., 3 in. wire cut brick on 6 in. concrete paving 973 sq.yd. 9th St. $4,417; 3 in. brick on concrete paving 4,200 sq.yd. 3rd St. $18,966; brick on concrete repaving Middleton St. between Chicago Great Western R.R. and Maple Leaf Blvd. $4,999. Grand total $78,411.

Mo., St. Louis—Bd. P. Serv., City Hall, concrete paving 10 alleys, to Alfred Lewald, Inc., 6025 West Cabanne Ave. $40,822—1 alley, to Creech Constr. Co., 5619 Natural Bridge Ave. $1,746—1 alley, to Skrainka Constr. Co., Security Bldg., $8,957—Sect. B-5 Western Mill Creek Public Relief Sewer, to Riley Contg. Co., 110 North 7th St. $17,253. Grand total $68,778. Noted May 23.

Mo., Sedalia—Pettis Co. graveling 9 mi. Tricum Special Road Dist., to Worman & Stone, Pittsfield, Ill., at $2.10, $2.06 and $1.40 per yd.

Mont., Havre—Paving 18.5 blocks Dists. 129 and 130, to S. Birch & Sons, Great Falls, $101,228.

Nebraska—State Hy. Comn., Lincoln, 4 in. road mixed sand surfacing 70,900 sq.yd. Federal Aid Project 277-D, to Yant Constr. Co., Omaha Natl. Bank Bldg., Omaha, $25,138. Noted June 6.

Neb., Dawson—Grading 12,750 cu.yd., sand graveling 7,636 sq.yd., concrete paving 14,251 sq.yd. Federal Aid Project 208-F, to Roberts Constr. Co., 1st Natl. Bank Bldg., Lincoln, $42,554. Noted June 6.

New Jersey—State Hy. Comn., Trenton, grading, rein.-con. paving 79,421 sq.yd. Route 39, Sects. 4, 5, and 6, Burlington Co., to F. Matazzo, 1287 Kaighn Ave., Camden, $314,968—43,900 sq.yd. Route 4, Sect. 5, Bergen Co., to Gerritsen Constr. Co., Lodi, $273,102. Noted June 20.

N. J., Garfield—Bd. City Council, City Hall, curbing, guttering, sidewalks on Herman, Jacob, William and Wilson Sts., to Malcolm Constr. Co., Inc., 57 Farnham Ave., Garfield. Est. $25,000.

N. J., Jersey City—Hudson Co., Court House, asphalt resurfacing roads, to Uvalde Asphalt Paving Co., 2 Greene St., Jersey City, $45,775.

N. J., Leonia—Bd. Boro Council, Boro Hall, grading, concrete paving Oakdene and Eastview Aves., to G. M. Brewster & Son, 263 West Fort Lee Rd., Bogota. Est. $25,000.

N. J., Paterson—Bd. Freeholders Passaic Co., Court House, grading, sheet asphalt on concrete paving Paterson-Hamburg Turnpike Sect. 1, to A. Vandermade, Planton Ave., Prospect Park, $139,485. Noted July 4.

N. J., Somerville—Bd. Freeholders Somerset Co., Court House, 8 in. single line rein.-con. paving Rocky Hill-Washington Headquarters Rd., to J. M. F. McGreavy, Manasquan, $133,422. Noted June 13.

N. J., Westfield—Town Council, Town Hall, bituminous macadam paving Hazel Ave., to Di-Donato & Ruffino, 120 East Grand St., Rahway, $20,298.

New York—A. W. Brandt, comr. Hys., Albany (**e.e. means engineers estimate**), bituminous macadam paving 0.75 mi. road in Schuyler Co., to W. Curtis & Co., Geneva, $27,370 e.e. $38,485—7.14 mi. Otsego Co., to Schnellman, Inc., Derby, $342,192 e.e. $477,468—concrete paving 4.91 mi. Onondaga Co., to La Mura Constr. Co., 684 East Fordham Rd., New York, $317,387 e.e. $472,873—2.9 mi. Monroe Co., to F. J. Cadin, Syracuse, $124,168 e.e. $177,858—6.8 mi. Broome Co., to Parlor City Constr. Co., 21 Exchange St., Binghamton, $389,666 e.e. $551,797—5.67 mi. Tioga and Tompkins Counties, to O'Day & Ambrose, Binghamton, $274,126 e.e. $401,916—6.95 mi. Seneca and Wayne Counties, to J. Bellardino, Seneca Falls, $289,055 e.e. $406,304—concrete repaving 4.45 mi. Washington Co. and 2.37 mi. Otsego Co., to M-K Eng. Co., Albany, $220,602 and $115,417 respectively e.e. $321,388 and $161,443 respectively. Grand total $2,099,983. Noted June 6.

N. Y., Buffalo—Erie Co., County Hall, rein.-con. paving McKinley Parkway, Part 1, G.M.S. 204, to T. J. McDermott, 1009 Ridge Rd., Lackawanna, $148,594.

N. Y., Buffalo—G. Fisk, comr. P. Wks., City Hall, to H. P. Burgard Co., 1968 Fillmore Ave., standard asphalt on concrete paving 8,588 sq.yd. Kenmore Ave. from Military Rd. to Eugene St., $37,780; 16,000 sq.yd. Kenmore Ave. from Village of Kenmore to Niagara Falls Blvd., $71,200; 5,578 sq.yd. Kenmore Ave. from point 1,400 ft. east of Delaware to Kenmore Village, $24,820; 5,342 sq.yd. Summit Ave. $23,235. Grand total $157,035.

N. Y., Buffalo — G. Fisk, comr. Dpt. Wks., City Hall, repaving Delaware Ave., to Rock Asphalt & Constr. Co., Morgan Bldg., $39,231. Noted June 13.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to O. B. Jr. Contg. Co., grading 88th St., $5,168—to Welsh Bros. Contg. Co., Purvis St., Gates Ave., $3,664—to Borough Asphalt Co., 1301 Metropolitan Ave., Brooklyn, asphalt paving 80th Ave. $5,989; 116th St. $27,565—to Carbloc paving Co., 50 Court St., Brooklyn, Lurting St., $17,222—to W. P. McDonald Constr. Co., 76 Lawrence St., Flushing 109th St., $11,355; Ditmars Ave., $10,801; 82nd St., $6,312—to Cleveland Trinidad Paving Co., Flushing 146th St., $4,404; 24th Ave., $20,909; 124th St., $7,943—to Highway Impvt. & Repair Co., Furmans Island, Brooklyn, Hughes St., $2,197. Grand total $123,530. Noted June 13.

N. Y., New York—J. Miller, pres. Manhattan Boro, Municipal Bldg., granite block repaving Bway. and Delancey St., to Leonard Paving Co., 233 Bway., $55,489 and $35,129 respectively—Leonard and East 40th Sts., to Meehan Paving Co., 90 West St., $27,564 and $9,848 respectively—curbing Madison Ave., to C. D. Neckwith, Inc., Seneca Ave. and Edgewater Rd., $21,167. Grand total $149,197. Noted June 13.

N. Y., New York—Dpt. Parks, W. R. Herrick, pres. Park Bd., Arsenal Bldg., Central Park, 2nd section bridle path in Van Cortlandt Park, to F. Mascali & Son, 645 East Tremont Ave., $47,193. Noted June 20.

N. Y., Somers—Office Westchester Co. Engineer, Court House, White Plains, bituminous macadam paving Moseman Ave., to Peckham Road Corp., 47 Mamaroneckk Ave., White Plains, $80,082. Noted May 30.

N. Y., Syracuse—Bd. Contr. & Supply, City Hall, widening, repaving Court St. and resurfacing Forest Hill Dr., to G. B. Dickinson, Union Bldg., $64,763 and $64,599 respectively—repaving Burnet Park Dr. and Onondaga and Kirk Parks, to Dale Constr. & Eng. Co., 1066 Geddes St., $12,810 and $1,803 respectively. Grand total $143,975.

N. C., Greensboro—Guilford Co., surfacing 3.17 mi. Pomona Rd., Phillips, Elwell, Lovett Aves., grading 24.24 mi. Haworth Springs, Oak Ridge, Huffine Mill, Jamestown, Guilford College and Bibsonville Rds., to R. G. Lassiter Co., Raleigh; preparing base 18.6 mi. Kimesville, Summerfield and Horseshoe Rds., to Welker Bros. & Peacock. Total $167,000.

O., Akron—Summitt Co., rein.-con. paving Emmett Rd., to Costigan Shroyer Constr. Co., Metropolitan Bldg., $53,016. Est. $50,000. Noted May 23.

O., Akron—Summit Co., vitr. brick, limestone aggregate paving 2.72 mi. New Portage-Uniontown Rd.—C H. Sect. A, to Hollinger & Davidson, 85 East Thornton St., $91,979. Noted June 6.

O., Bexley (Columbus P.O.)—S. W. Roderick, village clk., 2½ in. brick paving 2,400 ft. Mound St. and Pleasant Ridge Ave., to R. J. Dienst, 209 South High St., Columbus, $37,909. Noted June 20.

O., Canton — Constructing Georgetown Rd. N.E., to H. Wise, 1126 11th St. N.W., $29,333. Est. $30,000.

O., Canton — Paving Spring St. N. E. and Esther St. N. E., to Garaux Bros., Massillon-Canton Rd., $25,000; curbing intersections streets, to T. Lombardi, 1251 Harrison Ave. S. W., $25,508.

O., Cleveland—Cuyahoga Co., sheet asphalt paving 9,480 sq.yd. Richmond Rd., to H. G. Herring, Wayside Rd., $107,952. Est. $143,123.

O., Cleveland—Brick paving 4,850 sq.yd. Caine Ave., to Enterprise Paving & Constr. Co., 8444 Broadway, $24,545; oil asphalt paving 7,900 sq.yd. Neff Rd., to Gould & Mayback, 16113 Saranace Rd., $37,253.

O., Cleveland—Bd. Educ., F. G. Hogen, dir., improving grounds at Nathan Hale and Wilbur Wright Schools, to V. J. Pauline, 10708 Woodland Ave., $46,333; remodeling heating plant at Central High School, to W. R. Rhoton Co., 1397 East 111th St., $22,145; changing water lines at various schools, to Weiss Heating & Plumbing Co., East 55th St. and Cedar Ave., $6,484, and to R. E. Greene & Son, 4525 Detroit Ave., $1,287. Grand total $76,249. Noted June 6.

O., Cleveland Heights (br. Cleveland)—Sheet asphalt paving 5 roads, to Spence Bros., 2078 Random Rd., Cleveland, $48,915. Noted May 2.

O., Euclid (br. Cleveland)—Village, vitr. concrete paving 5 streets in Hillandale Allotment, to Cleveland Trinidad Paving Co., Western Reserve Bldg., Cleveland, $58,667. Noted June 13.

O., Salem—Asphalt on concrete paving 1 mi. West 5th St., to Kelley-Meyer Contg. Co., South Side Bank Bldg., Youngstown, $25,279. Est. $25,000.

O., Youngstown—Repaving Mahoning Ave., to E. J. Kane, 461 West Indianola Ave., $31,775. Est. $30,000.

Okla., Lawton—Grading, concrete paving 11,260 sq.yd. D. St., to Connelly Bros., East Reno, $25,747. Est. $30,457.

Okla., Tulsa—Grading, paving 1 mi. North Harvard Ave., to R. Tanner Paving Co., 1224 North Main St.., $36,519. Noted May 30.

Oregon—State Hy. Comn., Salem, paving 3.81 mi. Klamath Co., to N. D. Miller, Klamath Falls $119,360—grading, paving 6.67 mi. Jackson Co., to Washburn & Hall, Eugene, $132,117—7.4 mi. Lane Co., to Cochran Constr. Co., Portland $52,340—3.31 mi. Lane Co., to State Constr. Co., Albany, $138,000. Grand total $441,817.

Ore., Portland—Grading 800,000 lb. asphaltic concrete on 1st St. between Madison and Arthur Sts., to F. J. Gregorie, Portland, $9,849. Est. $53,081.

Pennsylvania—State Hy. Comn., Harrisburg, concrete paving 5.423 sq.yd. Warren Co., to Beck Constr. Co., Warren $53,392—5,460 sq.yd. Indiana Co., to A. F. Moreav, Indiana $20,299—22,160 sq.yd. Northumberland Co., to J. M. Hutchison & Warehood Bros., Altoona $106,247—80,162 sq.yd. Lycoming Co., to O. P. Bell Constr. Co., Sunbury $268,236—17,539 sq.yd. Lehigh Co., to G. H. Hardner, Allentown $60,567—11,775 sq.yd. Montgomery Co., to G. I. Thompson, Clearfield $42,027—47,000 sq.yd. Blair Co., to E. H. Brua, Hollidaysburg $224,010—76,517 sq.yd. Northumberland Co., to F. D. Kessler, Northumberland $446,772. Grand total $1,221,550. Noted June 6.

Pa., Pittsburgh—See "Unclassified."

Tenn., Memphis—Bituminous penetration paving Speed and Claybrook Sts., and concrete paving Kyle St., to F. D. Harvey & Co., 688 South Bellevue St., $85,100.

Tex., Dallas—Improving Forney Ave., from city limits to Tiller's Corner, to R. J. Estep & Co., Praetorian Bldg., $25,458.

Tex., Corpus Christi—Widening, paving, removing obstructions Chaparral St., to Brown & Root, P. O. Box 745, Austin, $73,105. Est. $75,000.

Utah — State Hy. Comn., Salt Lake City, grading, concrete paving 47,758 sq.yd. Tooele Co., to Olof Nelson, Logan, $117,413. Est. $127,749.

Virginia — Dpt. Hys., Richmond, graveling 5.633 mi. Project 8523DEB1, York Co., to Porter & Montgomery, Norfolk, $25,052 — macadam paving 3.743 mi. Project F581A, Clarke Co., to Carpenter-Major Bros. & Co., Inc., Clifton Forge, $88,997. Noted May 30.

Washington — State Hy. Comn., Olympia, 9,096 bbl. No. 2 oil on State Rds. 2 and 3, Kittitas Co., to Home Oil Co., 1210 Bailey St., Seattle, $37,347.

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Streets and Roads (Continued)

Wash., Tacoma—Paving 29,000 sq.yd. Proctor St., to Anderson & Lilljebeck, Tacoma. $65,885. Est. $74,125. Noted June 13.

Wash., Yakima—Concrete paving 10,741 sq.yd. West Orchard St., to George Milton Savage Co., 401 East 11th St., Tacoma. $29,671.

West Virginia—State Rd. Comn., Charleston, grading, concrete, bituminous macadam paving Boone Co., to H. Hatfield, Barboursville. $79,528—Braxton Co., to Parker Constr. Co., Morgantown. $57,467—Brooke and Hancock Counties, to A. Shuttle & Co., Fairmount. $101,422—Cabell Co., to Hatfield Constr. Co., 722 14th St., Huntington. $156,131—Jackson Co., to C. V. Rector & Son, Glenville. $86,975—Marion Co., to Ebersbach Constr. Co., Pomeroy, O. $171,131—Projects 2207, Part 1, and Project 3406-B, Mercer Co., to Abbot Constr. Co., Head of Capitol, Charleston. $85,548 and $77,604 respectively—Mercer Co., to Pendleton Constr. Co., Wytherville, Va., $64,185—Monongalia Co., to W. A. Wilson & Son, St. May's. $221,926—Monroe Co., to J. J. Battershill & Son, Lewisburg. $89,100—Monroe Co., to Janutolo Co., Fayetteville. $131,940—Ohio Co., to H. L. Seabright Co., 70 43rd St., Wheeling. $135,751—Putnam Co., to J. M. Cain & Co., Moore Bldg., Charleston. $192,932—amiesite paving Summers Co., to Brooks & Keys, Salem. $64,855—rein.-con. paving Tyler Co., to White Wood & Co., Princeton. $239,008. Grand total $1,965,503. Rejected bids grading, macadam paving P. 3213-B and C Grant Co.—P. 116, Kanawha Co. —P. 2066, Ohio Co.—P. 107, Sect. 1 and 3198, Morgan Co.—P. 3047, Wood Co. Noted June 6.

W. Va., Fairmount—Marion Co. Court, concrete paving 3 mi. Owen Davy Rd., Huntington Dist., to Ferguson Bros., Shinnston. $57,523.

Wis., Milwaukee—Dpt. P. Wks., R. E. Stoelting, comr., grading, paving 5 alleys, to Bodemann Constr. Co., 464 21st St., $74,675—1 alley, to Messenger Constr. Co., 5107 North Ave., $3,710—Congress and 62nd Sts., to J. C. Bluhm, 164 Burleigh St., $8,133 and $10,526 respectively—60th St., to Milwaukee General Constr. Co., 857 8th Ave., $3,659—Center St. and East Holt Ave., to White Constr. Co., 68 East Wisconsin St., $39,576 and $10,969 respectively. Grand total $151,248.

B. C., Abbottsford—Minister P. Wks., Victoria, grading 4¼ mi. Yale Rd., to Dawson, Wade & Co., 500 Beatty St., Vancouver. $46,359.

Ontario—R. M. Smith, deputy minister Dpt. P. Hys., Parliament Bldgs., Toronto, concrete paving two 7½ mi. and 2 mi. entrances to Windsor, Contr. 29-67, to Ryan Constr. Co. Ltd., 109 Ottawa St., Walkerville—7.4 mi. at Oro Corners, Contr. 29-68, to Curran & Briggs, Manning Chambers, Toronto — mixed macadam paving 6 mi. Brant Co. line to Bewdleys Subway, Contr. 29-72, to Brennan Paving Co. Ltd., 400 Gage Ave., N., Hamilton—7.7 mi. Kenilworth to Mount Forest, Contr. 29-74, to Dufferin Constr. Co., foot of Bathurst St., Toronto—7 mi. Berth Northerly, Contr. 29-75, to N. G. Henniger, Smiths Falls—3.2 mi. Collingwood, Contr. 29-77, to F. R. Wilford & Co. Ltd., 24 William St., Lindsay—traffic bound macadam paving 10 mi. Elginfield to Ailsa Carig, Contr. 29-76, to Kett Brothers, Hagersville—tile drainage on 4 mi. Newmarket side road to Holland Landing, Contr. 29-78, to Oral Beattie, Dundas—11 mi. Barrie to Fennels, Contr. 29-79, to Godson Contg. Co., 203 Richmond St. W., Toronto—concrete culverts Morrisburg to Carleton Co. line, Contr. 29-80, to Darch & Brown, Cardinal—4 concrete culverts Greenbank, Contr. 29-81, to A. Cavotti, 45 Jarvis St., Toronto—Elginfield to Exeter, Contr. 29-82, to Gaffney & Ward, West Moncton—Delhi, Contr. 29-83, to Holdcroft Constr. Co., Kingston—surface treating 8 mi. Ottawa westerly on Carling Ave., Contr. 29-84, to Bituminous Spraying & Contg. Co., Confederation Life Bldg., Toronto—8.2 mi. Morrisburg west and northerly, 6.3 mi. Winchester northerly, 7.8 mi. Summerston and 8.7 mi. Lancaster to Province of Que., Contrs. 29-85 and 86, to A. H. Parker, Cornwall—6 mi. Barrie, 8 mi. Shannonville, 16 mi. Belleville Southerly and 4 mi. Langstaffe easterly Contrs. 29-87 and 88, to Municipal Road Spraying & Oiling Co., 215 Sterling Rd., Toronto—7.2 mi. Sebringville to Mitchell, 12 mi. Kinloso to Kincardine, 24¼ mi. Haldemand to Canbaro, 14.6 mi. Dunnville to Becketts Bridge, 13.7 mi. Jarvis to Caledonia, and 4.1 mi. Renton to Simcoe, Contrs. 29-89 to 29-92 (inclusive) to R. Honsberger, Vineland. Est. $1,500,000. Noted June 13.

Ont., Bowmanville—Northumberland and Durham Counties (Cobourg), asphaltic paving 1.58 mi., to Ontario Amiesite Co., Commerce and Transportation Bldg., Toronto. $37,987. Est. $40,000. Noted Mar. 28.

Ont., Drayton—Concrete paving 3/4 mi. Main St., 30 ft., to Brennan Constr. Co., 400 Gage Ave. N., Hamilton. $43,300. Est. $45,000.

Ont., New Castle—Durham and Northumberland Counties (Cobourg) bituminous macadam paving 6.09 mi. road between here and Orono, to Merlo, Merlo & Ray, Sandwich St. E., Windsor. $135,995. Est. $140,000.

Ont., Owen Sound—Grey Co., gravel, macadam concrete paving roads, day labor. $125,000, maintenance $50,000. R. C. McKnight, Owen Sound, engr. Noted May 2.

Ont., Sandwich—Council, asphalt paving Virginia Court, Felix Ave., Granville Crescent and Marlborough Blvd., to S. P. West, 51 Victoria St., $35,622; concrete sidewalks on Granville Crescent and Virginia Court, to E. Warner, 29 Peter St., $1,997. Noted June 13.

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Ont., Sudbury—Concrete paving 30,000 sq.yd. Fir Lane and 7 streets, to Warren Bituminous Paving Co., 54 University Ave., Toronto. Est. $100,000.

Ont., Toronto—City Council, asphalt paving Wheeler Ave., to Kilmer & Barber, 10 Adelaide St., E., $4,779—brick block paving Wheeler Ave., asphaltic concrete paving Wrenson Rd. and concrete paving 2 lanes, to Grant Contg. Co., 47 Wellington St. E., $17,709—brick block paving Lee Ave., to Asphaltic Concrete Paving Co. of Toronto, Excelsior Life Bldg., $8,493—asphalt paving Metheun Ave., Shannon and Trinity Sts., to City Wks. Dpt., day labor, $10,648. Grand total $41,629.

Ont., Walkerville—H. W. Patterson, engr., Imperial Bldg., concrete paving, Durham Pl. and 4 roads, to Cadwell Sand & Gravel Co., Sandwich St., Windsor, $64,331, and to Merlo, Merlo & Ray, Sandwich St., East Windsor, $60,190. Noted May 30.

Ont., Willowdale—H. D. Goode, clk., North York Twp., concrete paving 4 mi. Bayview Ave. and Post Rd., to Grant Contg. Co., 47 Wellington St. E., Toronto, $57,770. Owners will purchase cement, $29,000. Est. $90,000. Noted May 16.

Ont., Windsor—Concrete and asphalt on concrete paving Goyeau St., to H. I. Bondy, 31 Bridge Ave., $30,000; Sandwich St. W., Highland Ave. and 2 lanes, to Cadwell Sand & Gravel Co., Sandwich St. W., $11,500.

Public Bond Elections

Coming Bond Elections

Waterworks—Mendenhall, Miss., $30,000.
Waterworks—Waurika, Okla., July 16, $52,000.
Sewers—Claremore, Okla., July 9, $54,000.
Sewers—La Porte, Tex., $90,000.
Bridge—Jefferson County, Tex., July 22, $1,100,000. B. B. Johnson, Co. Judge, Beaumont.
Airport—Natchez, Miss., $35,000.
High School Addition—Dawson County, Mont., $300,000.
School Improvements—Bay City, Tex., $200,000.

Bonds Voted

Waterworks—New Haven, Mo., $12,000. W. A. Fuller Co., St. Louis, Engrs.
Waterworks — Aline, Okla., $25,000. E. W. Gantt & Co., Oklahoma City, Engrs.
Waterworks—Atoko, Okla., $30,000.
Waterworks—Konowa, Okla., $30,000. Coon & McKinnon, Oklahoma City, Engrs.
Waterworks—Murfresboro, Tenn., $300,000.
School—Laredo, Tex., $225,000.

Buildings—Industrial

Proposed Work

Colo., Rocky Ford—FACTORY—Amer. Beet Sugar Co., 40 x 145 ft., beet pulp drying plant addition, brick, concrete, steel. $85,000.

Conn., Stamford—POWER PLANT—Stamford Hall Sanitarium, 70 Summer St., plans by Fletcher-Thompson, Inc., 542 Fairfield Ave., 1 story, 75 x 125 ft., brick, steel, concrete, incl. three 150 hp. boilers, 3 stokers. Bedford St. $50,000.

Ill., Chicago—RADIO SUPPLY FACTORY—Runzel-Lenz Electrical Mfg. Co., 1751 North Western Ave., plans by Zimmerman, Saxe & Zimmerman, 212 East Superior St., rebuilding 4 story factory, recently destroyed by fire. $150,000.

Ill., Chicago—SUB-STATION—Commonwealth Edison Co., 72 West Adams St., plans by Holabird & Root, 333 North Michigan Ave., new 3 or 8 story building or remodeling present 8 story building for sub-station, 117 North Dearborn St.

Ill., Decatur—MILL, etc.—Shellabarger Grain Products Co., sketches by Horner & Wyatt, 468 Bd. of Trade Bldg., Kansas City, Mo., 5 or 6 story, soy bean mill with office, concrete elevator, Brush College Rd. $60,000.

Ia., Dubuque—GARAGE and SALES ROOM—J. F. Rhomberg, 4th St., plans by G. J. Krajewski, 730 Main St., 1 story, basement, 100 x 200 ft., brick, stone, rein.-con. $50,000.

Me., Lewiston—GRAIN MILL—J. B. Ham Co., 19 School St., Auburn, plans by Edward Sales Co., 443 Congress St., Portland, 2 story, brick, steel, plain found. $40,000.

Md., Baltimore—PLANT—W. A. Fingles, 29 South Howard St., plans by E. G. Blanke, 330 North Charles St., 2 story, basement, 107 x 131 ft., brick, steel, Reistertown Rd. near Elgin Ave. $40,000.

Mass., Ashland — FACTORY — Warren Telechron Co. plans 2 story, brick, timber addition, plain found. $40,000 or more. Fay, Spofford & Thorndike, 44 School St., Boston, engrs.

Mass., Lynn—FACTORY—J. R. Freeman, Carlton St., plans by M. F. Burk, 173 Milk St., Boston, 2 story, brick, plain found., $40,000.

Mass., Lynn—FACTORY—L. W. Kenny & Co., 47 Collins St., altering and constructing 2 story, brick, timber addition, Collins St. $40,000. Engineer and architect not selected.

Mass., Salem — POWER PLANT — Eastern Massachusetts Electric Co., 197 Washington St., brick, steel, concrete, $100,000. Engineer and architect not selected.

Mass., Springfield—SALES, SERVICE and REPAIR GARAGE—Cadillac-LaSalle Co., M. J. Duryea, 563 State St., revised plans by Argonaut Realty Co., General Motors Bldg., Detroit, Mich., 1 and 2 story, basement, brick, steel plain found. $90,000. Noted Apr. 11.

Mass., Watertown — MANUFACTURING — J. W. Greer Co., 110 Windsor St., Cambridge, 2 story, 80 x 500 ft., brick, concrete, plain found. To exceed $40,000. Engineer and architect not selected.

Mass., Wayland—SERVICE and REPAIR GARAGE—Town Bd. Selectmen, revised plans, 1 story, brick, steel, plain found., Main St. $40,000. Former bids rejected. J. R. Worcester & Co., 79 Milk St., Boston, engrs. Noted June 27.

Mass., Westboro — PLANT — Bay State Abrasive Products Co., O. S. Bucknam, supt., brick manufacturing plant. To exceed $50,000. Private plans. Noted Mar. 28.

Mich., Detroit—FACTORY—Natl. Automotive Fibres, Inc., 2106 East Lafayette Ave., plans by I. M. Lewis, 503 Congress Bldg., 1 story, 160 x 425 ft., brick, steel, plain found., State Fair Ave.

Mich., Detroit—WAREHOUSE—Pub. Lighting Comn., 138 East Atwater St., plans by Smith, Hinchman & Grylls, archts. and engrs., 800 Marquette Bldg., 1 story, brick, steel, concrete, Southfield Ave. $150,000.

Mo., North Kansas City—PLANT—Midcontinental Tank Car Co., 10th and Cherry Sts., addition, incl. new equipment. $50,000. Private plans.

Mo., St. Louis—FREIGHT TERMINAL and EXPRESS — Southern Electric Terminal Ry., 3722 North Bway., sketches by Mauran, Russell & Crowell, Chemical Bldg., 8 and 12 story, basement, rein.-con., brick, stone freight terminal and express, High St. between Lucas and Morgan Sts., $1,000,000; also plans remodeling 10 story, rein.-con., brick passenger terminal, $500,000.

N. J., Hillsdale (mail Elizabeth)—POWER HOUSE—Dpt. Institutions & Agencies, State Office Bldg., Trenton, soon lets contract 2 story, basement, brick, steel, plain found., Hillsdale Hospital. $50,000. C. N. Leathem, Jr., Trenton, state archt.

N. J., Kearny (sta. Arlington) — POWER HOUSE — Delaware, Lackawanna & Western R.R. Co., G. J. Ray, chn. engr., Hoboken, will not build power station, on Hackensack River, $4,250,000. Project abandoned. Private plans. Noted Sept. 6.

N. J., Roselle—FACTORY—J. Dittel, 1107 Chandler Ave., plans by J. Anderson, 251 North Broad St., Elizabeth, 2 story, basement, 50 x 125 ft., brick, steel, plain found., 1107 Chandler Ave. $40,000.

N. J., Weehawken — FACTORY — Lubrication Purification Sales Co., 3rd and Creek Sts., Long Island City, N. Y., 2 story, basement, brick, steel, plain found., Kings Woods near Electric Ferry. $50,000. Engineer and architect not selected.

N. Y., Brooklyn — FACTORY — Savoia Macaroni Mfg. Co., 63rd St. and 15th Ave., plans by F. Savignano, 6005 14th Ave., altering 3 story, brick, 63rd St. and 15th Ave. $100,000.

N. Y., Brooklyn—SERVICE STATION and GARAGE—Caverly Holding Corp., R. Rosenblatt, pres., 101 x 101 ft., brick, Fulton St. and Grand Ave. $40,000. Maturity after November. W. T. McCarthy, 147 Pierrepont St., archt. Noted July 4.

N. Y., Carmel — ELECTRIC PLANT — New York State Electric Corp., 123 Cayuga St., Ithaca, electric plant.

N. Y., Laurel Hill (mail Flushing)—PLANT—Nichols Copper Co., Halle and Hobson Aves., plans by Leddy & Moore, 70 West 40th St., New York, 3 story, 77 x 77 ft. addition. $40,000.

N. Y., New York — PRINTING PLANT — Daily Mirror, Inc., 235 45th St., plans by J. H. Taylor Constr. Co., 31 Union Sq., altering 16 story office, store and loft building into printing plant, 235 East 45th St. $100,000.

N. Y., North Tarrytown—PLANT—Chevrolet Motor Co., 3044 West Grand Blvd., Detroit, Mich., plans by A. Kahn, Inc., 1000 Marquette Bldg., Detroit, Mich., 1 story, brick, steel, concrete plant. $1,500,000. Noted June 20.

N. Y., Roselle (br. Elizabeth)—DRESS FACTORY—J. Drittell, Chandler Ave., sketches by J. Anderson, 251 North Broad St., Elizabeth, 2 story, basement, 50 x 125 ft., brick, steel, plain found., 1107 Chandler Ave. $40,000.

O., Cleveland—FACTORY—Ohio Piston Co., C. Burnbaum, pres., 5337 St. Clair Ave., plans by Kalsch & Hoefler, 4500 Euclid Ave., brick, 5337 St. Clair Ave. $40,000.

Okla., Asher—GASOLINE PLANT—Skelly Oil Co., Tulsa, 12,000,000 cu.ft. natural gasoline plant. $75,000. Private plans.

Okla., Henryetta — FACTORY — Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa., bids after July 10, factory, incl. four 40 x 300 ft. cutting sheds, 200 x 300 ft. warehouse, two 110 x 177 ft. tank sheds, steel, concrete. Total est. $2,000,000. H. C. Heichert, Grant Bldg., Pittsburgh, Pa., archt. Contract for clay handling sheds, store room, to W. S. Bellows Constr. Co., 612 Oklahoma Natl. Bank Bldg., Oklahoma City, $78,000. Noted May 2.

Pa., Carnegie — MANUFACTURING — Super Paper Products Co. plans by Braziell & Anderson, 309 4th Ave., Pittsburgh, 1 story, 180 x 360 ft., brick, steel. $150,000. Noted June 6.

Buildings—Industrial (Continued)

Pa., Harrisburg—WAREHOUSE and GARAGE—Harrisburg Gas Co., 14th and Market Sts., 1 and 3 story warehouse and garage. $40,000. United Engrs. & Constructors Co. (Dwight P. Robinson Co.) 112 North Broad St., Phila., engrs. To exceed $40,000.

Pa., Phila.—FACTORY—J. S. Towsley, archt., 1913 Arch St., soon lets contract 1 story, 60 x 140 ft., and 60 x 122 ft., brick, steel addition, plain found., for Hess-Bright Co., Front St. and Erie Ave.

Tex., Beaumont—SERVICE STATION and GARAGE—J. W. Stuart, Gilbert Bldg., 2 story, 120 x 120 ft. super service station, garage. $75,000. Private plans.

Tex., Corpus Christi—PLANT—Owner, c/o P. Hemphill, c/o Portland Cement Assn., Athletic Bldg., Dallas, tile, hollow tile manufacturing plant, 3,000 tile daily capacity. $275,000.

Tex., Dallas—FREIGHT TERMINAL—Texas & Pacific Ry. Co., c/o E. F. Mitchell, ch. engr., Dallas, 800 ft. brick, rein.-con., concrete found., Pacific Ave. at Good St. $750,000.

Tex., Marshall—PLANT—Texas Milk Products Co. (Plant 2), Marshall, powdered milk plant. $200,000.

Tex., Mt. Pleasant—MILK PLANT—Chamber of Commerce milk plant. $75,000.

Wis., Waukesha—FOUNDRY—Glancy Mall Iron Corp. plans by A. A. Wickland & Co., archts. and engrs. 222 North Wells St., addition. Wisconsin and Central Sts. $100,000.

Man., Winnipeg—PLANT—See "Airports."

Ont., Cobalt — POWER PLANT — Canada Northern Power Corp. Ltd., B. V. Harrison, genl. mgr., complete plant with dam on upper Notch Montreal River, 20 mi. from here. $1,000,000. Private plans.

Ont., Delhi—FACTORY—Imperial Tobacco Co., Leamington, factory for processing, pressing, curing and packing tobacco, also warehouses. Main St. $100,000, Private plans.

Ont., Hamilton—PLANT—Coca Cola Co. of Canada, 90 Broadview Ave., Toronto, brick, steel, stone, Wellington and Wilson Sts. $100,000. Engineer and architect not selected.

Ont., Kitchener—PLANT—I. M. Card Lumber Co., Brethruyrth St., plant addition. $95,000.

Ont., Toronto — LAUNDRY — Brighton Laundry Ltd., 826 Bloor St. W., plans by Craig & Madill, 96 Bloor St. W., 2 story, basement, brick, steel, rein.-con. addition. $65,000.

Ont., Toronto — MANUFACTURING — Royal Knitting Co., T. Garfinkel, pres., 260 Spadina Ave., 4 or 5 story, basement, concrete, brick, steel, King St. W. $150,000-$200,000. Engineer and architect not selected.

Ont., Toronto—PRINTING PLANT—W. S. Johnstone Co., 106 Adelaide St., printing plant, Duncan St. $100,000.

Que., Drummondsville — PLANT — Drummondsville Cotton Co., plant addition. $100,000.

Que., Hull—FACTORY—Hull Match Co. soon takes bids new match factory, St. Redemptеur St. $125,000.

Que., Hull—FOUNDRY—Hull Iron & Steel Foundries Ltd., Montreal St., soon takes bids 4 story, basement, 90 x 300 ft. addition, and 60 x 100 ft. recreation building, rein.-con., brick, steel, plain founds., Montcalm St. $200,000.

Que., Montreal — FACTORY — Stinson-Reeb Supply Co., Ltd., 230 Dorchester St. W., factory, Desеrables St. $150,000.

Que., Montreal—FACTORY—Syndicate, c/o I. E. Wilder, 1465 Bleury St., factory, Bates Rd. $200,000.

Que., Rivere du Loup—POWER HOUSE—Municipal Council, new power house, G. Quinet, engr.

Que., St. Louis de Courville — FACTORY — Courville Overall & Knitting Co., plans by H. Laberge, 140 St. John St., factory. $100,000.

Saskatchewan — WAREHOUSE — John Deere Plow Co., Woline, Ill., warehouse at Swift Current, $75,000; warehouse addition, Saskatoon, $15,000; addition, Weyburn, $20,000.

Bids Asked

Calif., San Francisco—PLANT—See "Contracts Awarded."

Calif., Stockton — CEMENT PLANT — Port Stockton Cement Co., San Francisco, taking segregated bids cement plant on waterfront. $3,000,000. Roberts, Stevenson & Everett, 1101 Claus Spreckles Bldg., San Francisco, engrs. Noted May 9.

Mass., Brookline—GARAGE, SHOWROOM and REPAIR SHOP—A. M. Snyder & M. Rudnick, 18 Tremont St., Boston, taking bids 3 story, basement, 100 x 155 ft., rein.-con., plain found., 734 Commonwealth Ave. near St. Mary's St. $250,000. H. F. Bryant & Son, 335 Washington St., archts.

Mass., Cambridge—PLANT—See "Contracts Awarded."

Mass., Gloucester—FACTORY—F. E. Davis Fish Co., Rogers St., taking bids altering and constructing 1 story, basement, 75 x 85 ft., brick, rein.-con. addition, plain found. $40,000 or more. Densmore, Le Clear & Robbins, Park Sq. Bldg., Boston, archts.

Mass., Lowell—DYE HOUSE—See "Contracts Awarded."

Mass., New Bedford—FACTORY—See "Contracts Awarded."

Mo., Richmond Heights (mail St. Louis)—REPAIR GARAGE—See "Contracts Awarded."

N. H., Dover—SERVICE and REPAIR GARAGE—F. E. Grimes taking bids 1 story, 65 x 170 ft., brick, concrete, steel, plain found. $40,000. F. E. Richardson, 56 Grove St., archt.

N. J., Fort Lee—PLANT—M. Freehop, archt., 415 Lexington Ave., New York, taking bids 2 story, basement, brick, steel, plain found., Main St., for Universal Film Mfg. Co., Main St. $40,000.

N. J., Jersey City—FACTORY—Owner, c/o P. Simeone & Co., Inc., archts., 22 Journal Sq., bids about July 15, general contract 3 story, basement, brick, steel, rein.-con., plain found. $75,000.

N. J., Jersey City—POWER HOUSE, BOILER ROOM and TUNNEL—P. Simeone & Co., Inc., archts. and engrs., 22 Journal Sq., bids about Aug. 1, general contract 1 story, 85 x 100 ft., brick, steel, plain found., 68-72 Liberty Ave., for Brunswick Laundry, Inc., 222 Tonnelle Ave. $160,000. Noted June 28.

N. Y., Amsterdam — FACTORY — Mohawk Carpet Mills taking bids mill addition. $40,000 or more. Private plans. Noted June 6.

N. Y., Brooklyn — BOILER HOUSE and LAUNDRY — Brownsville & East New York Hospital bids about Aug. 1, boiler room and laundry, Avenue A and Rockaway Parkway. $40,000. E. M. Adelsohn, 26 Court St., archt. Noted July 4.

N. Y., Brooklyn—SHOP, GAS STATION and GARAGE—See "Contracts Awarded."

N. Y., New York—FACTORY—See "Contracts Awarded."

Contracts Awarded

Calif., Los Angeles—BOTTLING PLANT—Sparkletts Bottled Water Corp., 4500 York Blvd., 1 and part 2 story, 125 x 610 ft., brick, stone. Owner builds under supervision of C. Arisman. $100,000. Noted Mar. 14.

Calif., San Francisco — PLANT — American Can Co., 1291 Bway., New York, plant addition, day labor and separate contracts. Noted June 13.

Calif., San Pedro—WAREHOUSE—Los Angeles Compress & Warehouse Co., 543 Cotton Exch. Bldg., 1 story, 165,000 sq.ft. floor space addition, to Neil Co., 4814 Loma Vista Ave., Los Angeles. $250,000. Noted June 13.

Conn., Bridgeport—SERVICE and REPAIR GARAGE—A. J. Pascone, 1 and 2 story, 20 x 80 ft., and 50 x 80 ft., brick, steel, plain found., Rosedale and Oliver Sts., to J. Pascone & Sons, 73 Steuben St. Est. $40,000.

Conn., West Hartford—SERVICE and SALES—Capital Buick Co., Washington St., Hartford, 1 story, brick, steel, Raymond Rd., to H. K. Noyes & Son, Inc., 857 Commonwealth Ave., Boston, Mass. Est. $45,000.

Calif., Long Beach — FACTORY — Perfect Caster Co., 1 story, 70 x 100 ft., brick, steel, to Sherer & Son, 1865 East Anaheim St.

Ill., Cicero—FACTORY—Ostrander-Seymour Co., C. W. Ostrander, pres., 1900 South 5th Ave., general contract 1 story, brick, 1874 South 54th Ave., to G. P. Cullen, 2940 West Lake St. Est. $40,000.

Ill., Chicago—FACTORY—A. Epstein, archt., 2001 West Pershing Rd., general contract 4 story, 102 x 200 ft. top addition, 2201 Elston Ave., to Poirot Constr. Co., 38 South Dearborn St., for International Inks, Inc., c/o P. Ruxton, Inc., 2211 Elston Ave. Est. $250,000. Noted May 30.

Ill., Chicago—FACTORY—Oman & Lilienthal, archts., 435 North Michigan Ave., masonry and carpentry contract 1 story, 130 x 175 ft., brick, 841-55 Sedgwick St., to A. Marcus, 228 North La Salle St., for M. Snower Co., 534 Fullerton Ave. Est. $80,000.

Ill., Chicago—FACTORY and OFFICE—A. V. Telson Co., archts., 4804 North Kedzie Ave., masonry contract 2 story, 100 x 125 ft., brick, 4538-46 Fullerton Ave., for H. H. Buhrke Co., 4540 Fullerton Ave., to C. S. Miller, 5338 North Spaulding Ave.; carpentry work to N. C. Anderson, 4008 Milwaukee Ave. $80,000.

Ind., East Chicago—FACTORY—Briggs & Ilmy, engrs., 608 South Dearborn St., Chicago, Ill., general contract altering factory, 504 East 145th St., to H. B. Olney, 1200 East Chicago Ave., for G. B. Limbert & Co., J. D. Purdy, pres., 556 Fulton St., Chicago, Ill. $50,000.

Ind., Hammond—FACTORY—Stauffer Chemical Co., Rives-Strong Bldg., Los Angeles, Calif., (1st unit) brick, steel, to Tuscon Constr. Co., Youngstown, O., $500,000. Noted June 20.

Ind., South Bend—MACHINE SHOP and GARAGE—D. C. Leer, 1222 Lincolnway East, general contract 1 story, 66 x 100 ft., brick, rein.-con., steel, Michigan and South Sts., to J. Nelson Co., 212 Monroe Bldg. Est. $42,000.

Ia., Davenport — FOUNDRY — Black Hawk Fdry. & Machine Co., 323 South Clark St., 1 story basement, 110 x 160 ft., brick, steel addition, to A. H. Neumann & Co., 2015 Grand St., Des Moines. Est. $40,000.

Ia., Ft. Dodge—WAREHOUSE—International Harvester Co., W. D. Price, constr. supt., 606 South Michigan Ave., Chicago, Ave., 3 story, 100 x 150 ft., rein.-con., to C. E. Larson, Ft. Dodge. $140,000.

Mass., Attleboro—MANUFACTURING—J. T. Healey & Son, 196 Main St., 1 story, concrete found., Dunham St., to J. A. Varrieur, Union St.

Mass., Cambridge—PLANT—Dewey & Almy, 235 Harvey St., 1 story, brick plant and office addition, plain found., separate contracts. H. L. Kennedy, 80 Boylston St., Boston, archt.

Mass., Chicopee — SHOP — A. G. Spaulding Bros., Center St., 1 story, 40 x 85 ft. forging building, and 2 story, 30 x 100 ft. machine shop, brick, concrete, plain founds., to Adams & Ruxton Constr. Co., Main St., Springfield. Est. exceeds $40,000.

Mass., Dorchester (sta. Boston) — BOILER HOUSE—Mason Regulator Co., 1190 Adams St., 3 story, concrete, brick, steel addition, concrete found., to Scully Co., 238 Main St., Cambridge. Est. $40,000.

Mass., Marlboro—FACTORY—Marlboro Wire Goods Co., Lincoln St., 2 story, brick, stone, steel, rein.-con. addition, plain found., to L. Rocheford & Son, 44 Front St., Worcester. Est. $50,000.

Mass., New Bedford—FACTORY—E. T. Caswell, 570 Pleasant St., 2 story, brick, timber toy factory, incl. new heating plant, motor operating machinery. Purchass St., separate contracts. Private plans.

Mass., North Adams—SHOP—J. Hunter Machine Co., 2 Main St., 1 story, 75 x 155 ft. brick, steel, to Abertha w Constr. Co., 80 Federal St., Boston. Est. $75,000.

Mass., Somerville—FACTORY—Manning Mfg. Co., Park Ave., Rutland, Vt., 1 story, basement, brick, steel, concrete, plain found., to Mozzicato & Dipietro, 12 Hancock St., Medford. Est. $40,000. Noted June 6.

Mass., Springfield—PLANT—Hampden Paint & Chemical Co., 161 Armory St., rebuilding 2 story, brick, timber, Albany and Armory Sts., to E. F. Carlton, Inc., 1694 Main St. Est. $40,000.

Mich., Detroit—FOUNDRY—Long Mfg. Co., 2768 East Grand Blvd., general contract 1 story, 105 x 120 ft., rein.-con., brick, steel, plain found., Dequindre St., to E. Chase, 439 Penobscot Bldg. Est. $40,000.

Minn., St. Paul—PRINTING PLANT—Webb Publishing Co., 55 East 10th St., general contract 3 story, basement, to Paul Steenberg Constr. Co., 914 Builders Exch. Est. $200,000. Noted June 27.

Miss., Jackson—FERTILIZER PLANT—F. S. Royster Guano Co., Norfolk, Va., 30 ft. high to eaves, 175 x 400 ft. heavy timber and 40 ft. high, 60 x 100 ft. steel, tile, to D. J. Rose & Son, Rocky Mount, N. C. Est. $250,000.

Mo., Richmond Heights (mail St. Louis)—REPAIR GARAGE—J. Sprague, 1107 Bellevue Ave., 1 story, basement, 100 x 170 ft., rein.-con., brick, terra cotta, Big Bend and Dale Ave., separate contracts. $50,000. O. J. Popp, 1528 Arcade Bldg., St. Louis, archt.

Mo., Springfield—STOCK FEED MILL—Missouri Farmers Assn., c/o J. A. Helbig, purch. agt., 540 Benton Ave., rein-con., brick, Grant Ave. and Phelps St., to Southwest Eng. Co., McDaniel Bldg. Est. $50,000.

Mo., St. Louis—SUB-STATION—Union Electric Light & Power Co., 12th and Locust Blvds., general contract altering and constructing 1 and 2 story, 37 x 38 ft. and 54 x 100 ft., rein.-con., brick addition, 3916-22 Enright Ave., to Fruin-Colnon Contg. Co., Merchants-Laclede Bldg.

Mont., Havre—ROUNDHOUSE—Great Northern Ry. Co., Railroad Bldg., St. Paul., general contract 1 story, 8 stall, brick, timber, to Industrial Contg. Co., 3050-4th Ave. S., Minneapolis. Est. $65,000.

N. J., Clifton—FACTORY—Certified Hosiery Co., c/o Enbro Corp., archts., 111 Academy St., Newark, 1 story, basement, 80 x 150 ft., and 65 x 100 ft., brick, steel, rein.-con., plain found., Allwood Sect., to J. J. O'Leary, 125 Prospect St., Passaic. Est. $40,000.

N. J., Newark—FACTORIES, TANK, etc.—Pittsburgh Plate Glass Co., 4 Chester Ave., general contract 1 and 2 story, brick, steel, rein.-con., plain found., 53-75 Riverside Ave., to Pub. Serv. Production Co., 80 Park Ave. Est. $200,000.

N. J., Paterson—DYE HOUSE—O. K. Piece Wks., R. Nozzaro, 937 East 28th St., Paterson, general contract 1 story, basement, brick, steel, plain found., to Charles Cona Building Co., 383 Haledon Ave. Est. $40,000. Noted Apr. 18.

N. J., Paterson—ELECTRIC SUB-STATION—P. Serv. Electric & Gas Co., 80 Park Pl., Newark, general contract 2 story, basement, to P. Serv. Production Co., 80 Park Pl., Newark. Est. $700,000. Noted Jan. 31.

N. J., South Amboy—POWER PLANT—Jersey Central Power & Light Co., 20 South St., Asbury Park, general contract 1 story, 160 x 160 ft., brick, steel, plain found., to Deakman-Wells Co., 921 Bergen Ave., Jersey City. Est. $5,000,000. Noted Dec. 20.

N. J., Trenton—FACTORY—Thermoid Co., 1 story, 100 x 170 ft., brick, steel, concrete addition, to W. C. Ehret, Trenton Trust Bldg., $100,000.

N. Y., Brooklyn—BAKERY—Ebinger Baking Co., W. D. Ebinger, pres., 2209 Bedford Ave., 2 story, brick, to J. H. Uhdal, 1357 Rogers Ave. Est. $100,000. Noted July 4.

N. Y., Brooklyn—DISTRIBUTION STABLES, etc.—Sheffield Farms Co., 524 West 57th St., altering service, stables, wagon room, etc., to A. J. Robinson, 15 West 38th St., New York. $45,000. Noted June 13.

N. Y., Brooklyn — SHOP, GAS STATION, GARAGE — Lipo Realty Co., S. Pippoff, pres., 843 Ocean Ave., 1 story, separate contracts and day labor. $40,000. I. Kallich, 26 Court St., archt. Noted July 4.

N. Y., Long Island City—SERVICE GARAGE—Har Webb Realty Corp., H. Weprin, pres., 145 West 27th St., New York, 6 story, 2-8 Sylvan Pl., to Weprin & Glass Building Co., 145 West 27th St. Est. $100,000.

N. Y., New York—FACTORY—Superior Fireproof Door & Sash Co., S. Schafer, pres., 1811 Carter Ave., 2 story, 100 x 200 ft., brick, day labor and separate contracts. $150,000. Noted July 4.

N. Y., New York—MILK DEPOT—B. Munday, 322 West 22nd St., 2 story, 91 x 92 ft., brick, to W. C. Tobey, 250 8th Ave. Est. $45,000. Noted June 28.

N. Y., New York — STEAM GENERATING PLANT — New York Steam Corp., D. C. Johnson, 280 Madison Ave., altering and constructing 3 story, 107 x 178 ft., brick addition, to G. A. Fuller Co., 949 Bway. Est. $250,000. Noted June 28.

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Buildings—Industrial (Continued)

O., Akron—MILL—B. F. Goodrich Rubber Co., South Main St., 3 story, basement, 75 x 200 ft., brick, steel, to Clemmer & Noah, 2nd Natl. Bldg. Est. $200,000. Noted June 13.

O., Alliance—FACTORY—Alliance Steel Products Co., 1 story, 50 x 60 ft., Waverly Ave. $40,000. Owner builds.

O., Brecksville (br. Cleveland)—RADIO STATION—Stations W.T.A.M. and W.E.A.R., c/o F. J. Ryan, Cleveland Electric Illuminating Co., Public Sq., 2 story, basement, 59 x 82 ft., stucco, tile, concrete, to Sam. W. Emerson Co., 1836 Euclid Ave. Est. $150,000. Noted May 30.

O., Cleveland—FACTORY and OFFICE—Cleveland Chain & Mfg., Co., L. D. Round, Stop 3, Bedford Line, 40 x 100 ft. factory, 34 x 60 ft. office building, 1 story, brick, steel, to Felzer Co., 2234 Denison Ave. Est. $40,000. Noted June 13.

O., East Liverpool—FACTORY—Potters Supply Co., 2 story, basement, 40 x 210 ft. factory, 60 x 70 ft. storage building, brick, steel, concrete, Washington St., to J. A. Bryan Co., East Liverpool, $75,000.

O., Elyria—FACTORY—Elyria Belting & Machine Co., A. Altfeld, pres.-treas., 1 story, 40 x 105 ft. and 60 x 80 ft., brick, steel, to John Kaiser & Bros., Elyria Savings & Trust Bldg. Est. $40,000. Noted June 20.

Okla., Henryetta — FACTORY — See "Proposed Work."

Pa., Chester — GAS PLANT — Philadelphia Electric Co., 9th and Sansom Sts., gas manufacturing plant, to United Engrs. & Constructors Co. (Dwight P. Robinson Co.), 112 North Broad St., Phila.

Pa., Phila.—BULK OIL STATION—Vacuum Oil Co., 61 Bway., New York, bulk oil station, 58th and Schuylkill Sts., to Turner Constr. Co., 1700 Walnut St. Est. $60,000.

Pa., Phila.—COLD SETTLING—Gulf Refining Co., Frick Bldg., Pittsburgh, cold settling plant, Girard Point, to John M. Gill Co., City Central Bldg. Est. $60,000.

R. I., Providence—PLANT—Providence Gas Co., 100 Weybosset St., 1 story, stack, 25 oven coke plant, brick, steel, concrete, Aliens Ave. and Sassafras St., to Koppers Erecting Co., Union Trust Bldg., Pittsburgh, Pa. Est. $500,000.

R. I., South Kingston (mail Kingston) — MILL—Wakefield Textile Co., Main St., brick addition, to C. I. Bigney Constr. Co., 184 Washington St., Providence. Est. $42,000. Noted May 30.

Tenn., Chattanooga—MILL—Soddy Hosiery Mills, G. McMillan, pres., 2 story, concrete, brick addition, to M. K. Wilson Co., Power Bldg., $75,000.

Tenn., Kingsport—PLANT—Tennessee Eastman Corp. (subsidiary Eastman Kodak Co., 343 State St., Rochester, N. Y.) two plant additions largest building being 1 story, 100 x 320 ft., with 3 story section, to Gauger-Korsmo Constr. Co., Fidelity Bank Bldg., Memphis. Est. exceeds $1,000,000.

Tex., Burkburnet — CRACKING PLANT — Graver Corp., Todd Ave., East Chicago, Ind. (engrs. and contractors for cracking plant), pumps, to Worthington Pump & Mchy. Co., 105 Cedar St., New York, and Byron-Jackson Pump Co., Republic Bldg., Dallas; all pipe, to Crane Co., 836 South Michigan Ave., and G. N. Limbert Co., 570 Fulton St., both Chicago, Ill.; all electrical supplies, to General Electric Co., River Rd., Schenectady, N. Y., and Brown Instrument Co., Wayne and Roberts Aves., Phila., Pa.; insulation, to Johns-Manville Co., Madison Ave. and 41st. St., New York, and Banner Rock Products Co., Alexandria, Ind.; recirculating equipment, to R. P. Lient Oil Furnace Co., 3409 East 18th St., Kansas City, Mo., for La Salle Petroleum Co., Tulsa, Okla. Total est. $700,000.

W. Va., Hinton — ENGINE TERMINAL — Chesapeake & Ohio Ry. Co., C. W. Johns, ch. engr., Richmond, Va., improving engine terminal, to John W. Cowper Co., State Planters Bldg., Richmond, Va. Est. $125,000.

Man., Winnipeg—POWER PLANT—Winnipeg Hydro-Electric Municipal Development, Slave Falls Power Plant, incl. main power house, sluiceways, spillways, bridge, rock-fill dam at Slave on Winnipeg River, to John Gunn & Sons, Ltd., 508 Avenue Bldg., and to Stewart & Cameron, Ltd. Est. $8,000,000.

Ont., Belleville—FACTORY—Alemite Products of Canada, new building, to W. H. Patterson Constr. Co., Patterson Bldg., $60,000.

Ont., Hamilton — BAKERY — Jackson Bread Co. Ltd., bakery, to Poag & Kemp, 9 Westinghouse Ave., $40,000.

Buildings—Residential

Bids Asked

Conn., Norwich—July 15, by Consolidated Hotel Serv. Corp., 347 Park Ave., New York, 3 story, basement, 50 x 120 ft., 50 x 145 ft., and 30 x 40 ft. brick, steel Inn, West James St. $350,000. Harte & Shape, 247 Park Ave., New York, archts. Noted Apr. 25.

N. J., Bayonne—See "Contracts Awarded."

N. J., Hackensack—Owner, c/o P. J. Josier, archt., 240 Broad Ave., Palisades Park, bids about Aug. 1, general contract 5 story, basement, brick, steel, plain found., Prospect St. $500,000. Noted June 20.

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N. J., Hackensack—Owner, c/o J. L. Tillack, archt., 173 Main St., bids about July 15, general contract 5 story, basement, 160 x 180 ft., brick, steel, plain found., Prospect Ave. $350,000. Noted July 4.

N. J., Newark—Owner, c/o A. G. Brasch, archt., 60 Park Pl., bids about Aug. 1, general contract 7 story, basement, 70 x 150 ft., brick, steel, plain found., Washington St. $300,000. Noted June 6.

N. J., Pinewald—W. K. Oltar, Jeosky, archt., 130 West 42nd St., New York, soon lets contract general contract 8 story, basement, 210 x 360 ft., brick, steel, hotel plain found., Crystal Lake Shore, for Sangor Hotel Corp., B. W. Sangor, pres., 60 Park Pl., Newark. $1,000,000. Noted June 13.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Long Island City — See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., New York—Stafford Building Corp., L. Bernstein, pres., 17 East 42nd St., taking bids on separate contracts 16 story, 225 East 79th St. $500,000. J. Martine, 545 5th Ave., archt.

Tex., Abilene—July 16, by H. O. Wooten, c/o Wooten Grocery Co., 16 story, 75 x 140 ft., brick, stone, rein.-con. hotel and theatre. David S. Castle Co., 701 Alexander Bldg., archts. Noted May 2.

Wash., Everett—Aug. 15, by C. A. Merriam, archt., Smith Tower, Seattle, altering and constructing 4 story, 100-room top addition to hotel, also 100-car garage, Lombard and Hewitt Aves., for Mitchell Hotel Co. $300,000.

Wash., Seattle—G. J. Gwinn, (owner and archt.), Orpheum Theatre Bldg., bids about July 28, 4 story, basement, 94 x 110 ft. masonry, also 24 car garage, 900 Queen Anne Ave. $150,000. Noted June 6.

Wash., Seattle—H. James, archt., Lowman Bldg., bids about July 25, 5 story, basement, 60 x 120 ft., Class A, 1st Ave. N. and Harrison St. $190,000.

Contracts Awarded

Calif., Los Angeles—W. Haussler, 8 story, basement, 91 x 127 ft., stone, to John M. Cooper, 321 Rives-Strong Bldg., $300,000. Noted June 6.

Fla., Passagrille—Owner, c/o Hadley & Nordstrom, engrs. and archts., St. Petersburg, 2 story, basement, 130 x 260 ft., concrete, to Logan Bros., 916 Citizens Bank Bldg., Tampa, $250,000.

Ind., Evansville—A. O. Hassensall & Co., 315 The Claremont, 2 story, basement, 75 x 108 ft., brick, steel, plain found., 2nd and Locust Sts., to M. J. Hoffman Constr. Co., 402 Furniture Bldg., $150,000 cost plus percentage basis. Steam heating, to H. G. Newman & Co., 511 South 4th St.

Ia., Sioux City—K. A. Murray, c/o Murray Studebaker Co., Sioux City, 3 story, basement, 50 x 114 ft., rein.-con., brick, plain found., 17th and Nebraska Sts., to Coomer & Small, United Bank Bldg., $150,000.

Mass., Lynn—Fame Constr. Co., 202 Walnut St., 4 story, basement, brick, plain found., Whiting St., to Frasca Constr. Co., 91 Harbor St. Est. $150,000.

Mass., Lynn—S. I. Lovell, 192 Union St., 5 story, basement, 40 room, brick, steel hotel, plain found., to Duncan Constr. Co., 7 Monroe St. Est. $150,000. Noted May 9.

Mass., Medford (br. Boston)—A. Morabito, 60 Derby St., West Somerville, 4 story, stone, irregular sized, concrete found., Bway., to Mozzicato & Di Pietro, 12 Hancock St. Est. $150,000 or more.

Mo., St. Louis—Dorothy Investment Co., c/o S. Hamburg, Jr., 1043 Arcade Bldg., 3 story, basement, 38 x 120 x 132 ft., rein.-con., brick, terra cotta, cut stone incl. garage in basement, to Jacob Rubin Sons, 18 North 8th St. Est. $375,000. Noted June 20.

N. J., Bayonne—L. Zeik, 739 Hudson Blvd., 4 story, basement, brick, steel, separate contracts, $150,000. C. Shilowitz, 26 Journal Sq., Jersey City, archt.

N. Y., Brooklyn—J. H. Sand & N. G. Pease, 24 Lenox Rd., 6 story, Lenox Rd. and Flatbush Ave., separate contracts. $200,000. Seelig & Finkelstein, 153 Pierrepont St., archts.

N. Y., Brooklyn—B. R. Levinson, 1770 East 15th St., 6 story, Ocean Ave. and Avenue R, separate contracts. $200,000. Seelig & Finkelstein, 153 Pierrepont St., archts.

N. Y., Buffalo—G. F. Wallace Co., Inc., 2854 Delaware Ave., Kenmore, brick, tile, 3303 Bailey Ave. $150,000. Owner builds. A. Hausauer, Kenmore, archt.

N. Y., Long Island City—S. Cayne, 1225 East 13th St., Brooklyn, 6 story, 80 x 100 ft., brick, timber, separate contracts. $150,000. Private plans. Noted June 28.

N. Y., New York—H. E. Heuer, 285 Madison Ave., 6 story, 74 x 90 ft., brick, timber, 501 West 183rd St., separate contracts, $150,000. W. C. Sommerfeld, 501 West 183rd St., archt.

N. Y., New York—National Club Hotels, Inc., 535 5th Ave., hotel known as Pickwick Arms, to M. Shapiro & Sons, 1560 Bway. Noted June 20.

Pa., Buck Hill Falls—Buck Hill Falls Co., c/o C. F. Jenkins, 7th St. and Washington Sq., Phila., 6 story, rein.-con. hotel addition, to Turner Constr. Co., 1700 Walnut Sts., Phila. Est. exceeds $150,000.

Ont., Windsor—Greater Windsor Development Co., Dougall Ave., brick, stone, concrete, Dougall Ave., to J. W. Butler Constr. Co., Royal Bank Bldg., Toronto. Est. $350,000.

Buildings—Commercial

Proposed Work

California—MEMORIAL—Superv. Sacramento Co., special tax levy for memorial buildings at Sacramento $210,000; Galt $70,000, Isleton $70,000. Engineer and architect not selected.

Calif., Stockton — PASSENGER DEPOT — Southern Pacific R.R. Co., G. W. Boschke, ch. engr., 65 Market St., San Francisco, brick, steel, concrete. $325,000.

D. C., Wash.—CLUB—American Pharamceutical Assoc. plans by J. R. Pope, 542 5th Ave., New York, headquarters, Upper Water St. between 22nd and 23rd Sts. $1,000,000. Noted Apr. 4.

D. C., Wash.—MUNICIPAL—District Comrs., District Bldg., plans by A. L. Harris, municipal archt., District Bldg., Pennsylvania and Indiana Aves., 6th, 3rd and D Sts. $10,000,000.

Ill., Cairo—ARMORY—Illinois National Guard plans by H. H. Hammond, Capitol Bldg., Springfield, armory, $200,000.

Ill., Decatur — ARMORY — Illinois National Guard plans by H. A. Hammond, superv. archt., Capitol Bldg., Springfield, armory, Eldorado and Jackson Sts. $225,000.

Ill., Joliet—CELL HOUSE—Dpt. P. Welfare, R. Brandon, dir., plans by H. A. Hammond, Capital Bldg., Springfield, new cell house, block type with four galleries, service tunnels, Stateville (State Penitentiary). $350,000.

Ill., Springfield—MONUMENT—State Legislature appropriated $175,000, rebuilding Lincoln Monument. H. A. Hammond, Capitol Bldg., superv. archt.

Ia., Des Moines — STORE — Globe Clothing Co., H. Blotsky, pres., 323 Walnut St., sketches 7 story, basement, 44 x 135 ft., rein.-con., brick, stone addition, 4th and Walnut Sts. $200,000.

Kan., Newton—STATION—Atchison, Topeka & Santa Fe Ry. Co., Topeka, H. W. Wagner, ch. engr. Eastern lines, soon lets contract 2 story, rein.-con., brick, $150,000. E. A. Harrison, 80 East Jackson Blvd., Chicago, Ill., archt. Noted Apr. 25.

Kan., Ottawa — HOSPITAL — Franklin Co. plans by Washburn & Storkey, Ottawa, hospital. $150,000.

Kan., Ottawa—MAUSOLEUM—Cairo Mausoleum Co., Iola, sketches by F. C. Churchill, 119 South 1st St., Iola, rein.-con., stone, marble, 368 crypts, four memorial rooms. $150,000.

Ky., Louisville—EXCHANGE—Southern Bell Telephone & Telegraph Co., Atlanta, Ga., 190 x 201 ft., Chestnut St. between 5th and 6th Sts. $500,000. Private plans.

Md., Baltimore—DEPARTMENT STORE—J. W. Sloan, c/o Smith & May, archts., Calvert Bldg., 3 or 5 story, 40 x 120 ft., brick, limestone, steel, Saratoga and Howard Sts. $200,000.

Md., Baltimore—HOSPITAL—West Baltimore General Hospital, c/o T. W. Pietsch, archt., Amer. Bldg., and J. Freund, 1307 St. Paul St., 3 story, brick, steel, concrete, Raynor Ave., Lanvale and Ashburton Sts. $400,000.

Mass., Boston—MEDICAL—Owner, c/o A. P. Pearce, Jr., 15 State St., revised plans by Blackall, Clapp & Whittemore, 31 West St., 8 story, basement, 60 x 300 ft., brick, steel, limestone, plain found., Bay State Rd. and Sherborn St. $1,000,000. Noted Aug. 9.

Mass., Dorchester (sta. Boston)—STORE and OFFICE—S. S. Kresge Co., Kresge Bldg., Detroit, Mich., sketches by H. Holmes, c/o owner, 4 story, basement, 60 x 100 ft., brick, stone, plain found., 790 Dudley St. $150,000.

Mass., Lexington, (br. Boston) — BANK — Lexington Trust Co., E. G. Preston, pres., 1778 Mass. Ave., plans by T. M. James Co., 3 Park St., Boston, 1 story, basement, brick, marble, stone, steel, plain found., Mass. Ave. and Muzzy Sts. $150,000.

Mass., Lexington and Waltham—HOSPITAL—Middlesex Co., W. C. Wardwell, Court House, East Cambridge, sketches by J. H. Ritchie & Associates, 250 Stuart St., Boston, 5 story, basement, brick, steel, plain found., Trapella Rd. $1,000,000. Noted Jan. 10.

Mass., Needham—STORE and OFFICE—A. T. Nelson, 1 Federal St., Boston, sketches by Krokyn & Browne, 120 Milk St., Boston, 2 story, basement, 75 x 145 ft., brick, plain found., Great Plain Ave. $150,000.

Mich., Alma — HOME — Michigan Masonic Home plans by Osgood & Osgood, Monument Square Bldg., Grand Rapids, 2 story, basement, rein.-con., brick, plain found. $800,000.

Mich., Battle Creek—THEATRE—W. S. Butterfield Theatres, Inc., W. S. Butterfield, pres., 505 Insurance Exch. Bldg., Detroit, plans by J. E. Eberson, 212 Superior St., Chicago, Ill., 12 story, brick, West Main St. $500,000. Maturity about 3 months.

Mich., Detroit — ARMORY — State Naval Reserve Bd., Lansing, plans by Stratton & Hyde, 904 Marquette Bldg., 1 and 2 story, 145 x 275 ft., brick, stone, steel, plain found. $250,000.

Buildings—Commercial (Continued)

Mich., Detroit—SALES and SERVICE—S. Hickey, 8939 Grand River Ave., plans by A. Kahn, 1000 Marquette Bldg., 2 story, part basement, rein.-con., brick, steel, plain found., Grand River Ave. $150,000.

Mich., Detroit—STORE, OFFICE and BALLROOM—Metropolitan Holding Co., c/o C. N. Agree, archt., 1140 Book Bldg., 6 story, basement, 120 x 125 ft., brick, concrete, steel, Jefferson and Newport Aves. $275,000.

Mich., Grosse Pointe Farms (mail Grosse Pointe)—THEATRE—R. O. Derrick, archt., Union Trust Bldg., Detroit, soon lets contract 2 story, basement, 100 x 115 ft., rein.-con., brick, steel, stone, plain found., McKinley Ave., for Grosse Pointe Theatre Co., 1910 Buhl Bldg., Detroit. $150,000.

Mich., Kalamazoo—HOSPITAL—Kalamazoo State Hospital Bd., 3 and 4 story, basement, rein.-con., brick, unit to hospital, plain found. $300,000. Engineer and architect not selected.

Mo., Kansas City—WAREHOUSE—T. Green Grocer Co., Santa Fe and St. Louis Aves., 6 story, basement warehouse. $150,000.

Mo., St. Louis—RESTAURANT and STORE—Thompson Dairy Lunch Room, 718 Olive St., soon takes bids 4 story, basement, 50 x 127 ft., rein.-con., brick, stone, terra cotta, Olive St., near 8th St. P. J. Bradshaw, 718 Locust St., archt.

N. J., Newark—BANK—Howard Savings Institution, 768 Broad St., plans by J. H. and W. C. Ely, 605 Broad St., 1 story, basement, 55 x 110 ft., brick ,steel, plain found., 268-70 Clinton Ave. $150,000. Noted July 4.

N. J., Perth Amboy—BANK and OFFICE—Owner, c/o J. N. Pierson & Son, archts., 198 Jefferson St., revised sketches 10 story, basement, brick, steel, plain found., New Brunswick Ave. and State St. $350,000. B. Goldberger, 117 Smith St., assoc., archt. Noted June 27.

N. J., Perth Amboy—LOFT and STORE—C. I. Silk, c/o B. Goldberger, archt., 117 Smith St., 3 story, basement, brick, steel, rein.-con., State St. $150,000. Noted July 4.

N. Y., Long Island City — WAREHOUSE — Walgreen Drug Co., 1351 Bway., New York, 100 x 175 ft. warehouse, Hamilton St. To exceed $150,000.

N. Y., New York—HOSPITAL—Bronx Maternity Hospital, 1072 Grand Concourse, hospital, 166th St. and Grand Concourse. $1,000,000. Engineer and architect not selected.

N. Y., New York—OFFICE—J. Medvin, 134 West 34th St., 12 story, 22 x 99 ft., brick, steel, 134 West 34th St. $200,000. Maturity in October or November. R. H. Segal, 475 5th Ave., archt. Noted June 28.

N. Y., New York—STORAGE and LOFT—Corporation, c/o Trinity Church, 72 Wall St., plans by Renwick, Aspinwall & Guard, 8 West 40th St., 12 story, 166 x 175 ft., brick, timber, Hudson and Debrosses Sts. $5,000,000.

N. Y., New York—STORAGE and RESTAURANT—Horn & Hardart Co., 600 West 50th St., bids latter part of month, general contract 46 x 120 ft., 122 Pearl St. and 86 Water St. $175,000. F. P. Platt & Bro., 221 West 57th St., archts. Noted July 4.

N. Y., New York—STORE, OFFICE and PRINTING—Dow, Jones & Co., 44 Broad St., store, office and printing plant, 453 West 30th St. To exceed $150,000.

N. Y., New York — STORE, OFFICE and SHOWROOM — C. Vanderbilt, c/o Rude Realty Corp., A. S. Bing, pres., 18 East 48th St., plans by R. Kohn and F. Vitolo, 56 West 45th St., 30 story, 75 x 100 ft., brick, steel, 501 Madison Ave. $1,000,000.

N. C., Greensboro—CLUB—Merchants & Manufacturers Club, J. Wiggins, chn. building com., Greensboro, plans by C. C. Hartmann, Greensboro, club, incl. swimming pool, gymnasium, ball room, dormitory space, club rooms. $150,000.

N. C., High Point—CITY HALL—City plans by H. Barton, Jefferson Standard Bldg., Greensboro, 3 story, basement, 50 x 100 ft. addition. $150,000.

O., Akron—Y. M. C. A., 259 South Main St., or Natl. Y. M. C. A., 347 Madison Ave., New York, plans by Good & Wagner, 191 South Main St., boys Y. M. C. A. building, Bowery Center and Water Sts. $1,000,000.

O., Cincinnati — OFFICE, THEATRE and STORE — Thos. Emery Sons, Inc., 115 East 4th St., plans by W. W. Ahlschlager, 65 Huron Ave., Chicago, Ill., A. B. Liptak, 565 5th Ave., New York, and Delany & Aldrich, 126 East 3rd St., New York, 18 story, Vine and Race Sts. $8,000,000. Noted May 2.

O., Cleveland—STAFF—University Hospitals Assn., c/o P. Potter, secy., Adelbert Rd., plans by A. Garfield, National City Bldg., 3 story, basement, brick, steel, concrete, Adelbert and Euclid Aves. $150,000.

O., Cleveland—WAREHOUSE—Nickel Plate Development Co., Terminal Tower, soon lets contract 2 story, 50 x 201 ft., rein.-con., brick, East 37th St. and Croton Ave. $150,000. McGarry & McGarry, 214 Euclid Ave., archts.

O., Dayton—EXCHANGE—Ohio Bell Telephone Co., 4th and Jefferson Sts., plans by Schenck & Williams, 3rd Natl. Bank Bldg., rein.-con., brick, steel, plain found., 2nd and Wilkinson Sts. $1,750,000.

O., Hamilton—BANK and OFFICE—First Natl. Bank & Trust Co., plans by Childs & Smith, 720 North Michigan Ave., Chicago, Ill., 8 story, 3rd and High St. $750,000.

Okla., Oklahoma City—Y.M.C.A., sketches 6 story, basement, 125 x 150 ft., rein.-con., plain found., 316 West 1st St. $400,000. Engineer and architect not selected.

Ore., Klamath Falls—EXCHANGE—Pacific Telephone & Telegraph Co., 532 Oak St., Portland, 2 story, basement, 100 x 102 ft., 8th and Pine Sts. $175,000. Engineer and architect not selected.

Ore., Portland — HOSPITAL — Episcopal Church, c/o W. T. Sumner, Ainsworth Bldg., altering and constructing 1 story addition, Good Samaritan Hospital, Portland Heights. $250,000.

Ore., Portland—WAREHOUSE—Hudson Duncan Co., 309 East Taylor St., 4 story, 100 x 200 ft., East Water, Oak, Pine Sts. and Willamette River. $150,000. Engineer and architect not selected.

Pa., Altoona—HOSPITAL—Altoona Hospital, Inc., bids probably in spring 6 story, 42 x 85 ft., brick, concrete addition, 7th St. and Howard Ave. $300,000. Hunter & Caldwell, Central Trust Bldg., archts. Noted Oct. 4.

Pa., Pittsburgh—OFFICE—Gulf Refining Co., Frick Bldg., bids probably in September, general contract 35 story, 7th and Grant Sts. $1,000,000. Trowbridge & Livingston, 527 5th Ave., New York, archts. Tenny & Ohmes, 101 Park Ave., New York, mechanical engrs. Noted July 4.

Pa., Pittsburgh—OFFICE—National Union Fire Insurance Co., 139 University Pl., plans by A. Garfield, Natl. City Bldg., Cleveland, O., 7 story, through basement, brick or stone to connect with present building. $600,000.

Pa., Pittsburgh—STORE—Boulevard Development Co. plans by Hunting, Davis & Dunnells, Century Bldg., 3 story, basement, 60 x 80 ft., brick, steel, Wood and Diamond Sts. $150,000

Tenn., Nashville—GARAGE—Prichett-Thomas Co., 717 Stahlman Bldg., plans by Marr & Holman, Stahlman Bldg., 6 story, basement, 100 x 175 ft., rein.-con., brick, stone, 7th Ave. between Church and Commerce Sts. $500,000.

Tex., Brownsville—STORE and OFFICE—T. Saxe, Milwaukee, Wis., or c/o Chamber of Commerce, Brownsville, 6 story, part basement, 34,000 sq.ft. floor space, brick, rein.-con., plain found. $150,000.

Tex., Dallas—DEPARTMENT STORE—Dreyfuss & Son, c/o S. Dreyfuss, 5 or 6 story, brick, steel, stone, rein.-con., Ervay and Main Sts. $350,000-$400,000. Engineer and architect not selected.

Tex. ,El Paso—OFFICE—Trost & Trost, archts., Two Republic Bldg., bids after Aug. 1, 13 story, 120 x 180 ft., brick, steel, stone, rein.-con., for C. N. Bassett. $300,000. Noted June 13.

Tex., San Antonio—COMMUNITY CENTER—Realty Finance Co., 1022 Smith-Young Tower, 2 story, 180 x 346 ft., rein.-con., hollow tile, plain found., Main Ave. $500,000.

Utah, Provo — HOSPITAL — State Building Comn., Capitol Bldg., Salt Lake City, plans by J. Nelson, Provo, probably rein.-con., brick addition to state mental hospital. $175,000.

Newfoundland, Labrador—HOSPITAL—International Grenfell Assn., plans by G. D. Thompson, 2049 McGill College Ave., Montreal, Que., hospital.

Ont., Fort William—STORE—Metropolitan Stores Ltd., 136 Dundas St., London, 2 story, basement, brick, stone, concrete, Victoria Ave. $150,000. Private plans.

Ont., London—OFFICE—Huron & Erie Mortgage Corp., 442 Richmond St., plans by Watt & Blackwell, steel. $1,000,000.

Ont., Niagara Falls—HOSPITAL—Niagara Falls General Hospital, C. N. Glendenning, River Rd., plans by W. L. Somerville, 2 Bloor St. W., Toronto, 3 story, basement, brick, stone addition. $150,000. Noted June 20.

Ont., North Bay—COURT HOUSE and JAIL—Dpt. P. Wks., Parliament Bldgs., Toronto, plans by F. R. Heakes, Parliament Bldgs., Toronto, brick, stone, steel, concrete. $150,000.

Ont., Toronto—OFFICE—Trusts & Guarantee Co. Ltd., 302 Bay St., plans by Sparling, Martin & Forbes, Metropolitan Bldg., 6 story, brick, steel, concrete top addition. $200,000.

Ont., Toronto—OFFICE—Syndicate, c/o F. W. Tanner, Monarch Securities, 1167 Bay St., plans by N. A. Armstrong Co. Ltd., 7 King St., 16 story, basement, 80 x 135 ft., brick, steel, rein.-con., plain found., Temperance St. $350,000.

Que., Chicoutimi—HOSPITAL—City plans by Alfred Lamontayne, P.O. Box 149, hospital. $200,000.

Que., Joliette—GARAGE—J. Dufresne plans by R. Gariepy, 29 St. James St., Montreal, garage. $200,000.

Que., Montreal—ARMOURY—Victoria Rifles of Canada, armoury, Cathcart St. $200,000.

Que., Montreal—GARAGE—E. A. Doucet, 195 St. Catherine St. E., garage, Fabre St. $200,000.

Que., Montreal—THEATRE—Famous Players Canadian Corp., Paramount Bldg., New York, plans by T. W. Lamb, 644 8th Ave., New York, brick, steel, Bleury and St. Catherin Sts. To exceed $1,000,000. Noted May 10.

Que., Shawinigan Falls — THEATRE — R. Garepy, 29 St. James St., Montreal, theatre. $150,000.

Que., Ville Marie—COURT HOUSE and GAOL—Provincial Govt., Quebec, court house and gaol. $200,000.

Bids Asked

Calif., Glendale — MAUSOLEUM — Forest Lawn Properties Assn., 1738 Glendale Ave., taking sub-bids steel, concrete addition, $650,000. F. A. Hanson, 1738 Glendale Blvd., engr.

Calif., Los Angeles — STAGES — Paramount Famous Players-Lasky Corp., 5451 Marathon St., taking bids 80 x 250 ft., 72 x 280 ft., rein.-con., steel stages, remodeling, reconstructing into sound proof buildings 2 stages. $150,000. Private plans.

Calif., Vallejo — MEMORIAL — Solano Co. taking bids rein.-con. memorial. $100,000. Coffman, Sahlberg & Stafford, Forum Bldg., Sacramento, archts. Noted Feb. 21.

Ill., Moline — OFFICE — W. H. Schulzke, archt., 506 15th St., bids about Aug. 1, 7 story, basement, 110 x 140 ft., brick, concrete, plain found., for Fifth Ave. Realty & Building Corp. $380,000.

Ind., Anderson—NEWSPAPER HOME—July 15, by Herald Publishing Co., 2 story, 60 x 104 ft. modern newspaper plant, 12th and Jackson Sts. $160,000. E. F. Miller, Anderson, archt.

Ia., Anamosa—PRISON—H. F. Liebbe, state archt., State House, Des Moines, bids about Sept. 15, prison, for State Bd. Control, Des Moines. $190,000. Noted June 13.

Mass., Amherst—HORTICULTURE—July 13, by Massachusetts Agriculture College, F. C. Kenney, Amherst, brick, steel. $200,000. J. H. Ritchie & Associates, 100 Arlington St., Boston, archts. Noted July 4.

Mass., Boston—OFFICE—Lamson & Hubbard Corp. 330 Boylston St., taking bids 6 story, basement 30 x 125 ft., marble, limestone, steel, plain found., 304-306 Boylston St. To exceed $150,000. I. Richmond, 248 Boylston St., archt.

Mich., Jackson—THEATRE—July 20, by M. H. Finkel, archt., 153 Elizabeth St., Detroit, 2 story, basement, 72 x 140 ft., brick, steel, rein.-con., plain found., for W. S. Butterfield Theatre Corp., 159 Elizabeth St., Detroit. $300,000. Noted July 4.

N. J., Elizabeth—POLICE HEADQUARTERS—July 22, by Bd. City Comrs., City Hall, 2 and 3 story, 60 x 150 ft., brick, steel, plain found., Morell and Catherine Sts. $250,000. L. Quien, Jr., 229 Broad St., archt. Noted June 27.

N. J., Montclair—PROFESSIONAL—A. E. Ramhurst, archt., 516 Bloomfield Ave., bids about July 15, general contract 3 story, basement 36 x 145 ft., brick, steel, plain found., Bellevue Ave., for A. Wallace, 204 Bellevue Ave., Upper Montclair. $150,000. Noted July 4.

N. J., Newark—STORE—S. S. Kresge Co., Kresge Bldg., Detroit, Mich., taking bids 1 story, basement, brick, steel, plain found., 151 Market St. $150,000. Private plans.

N. J., Paterson—OFFICE and STORE—Cowega Realty Co., L. Gottlieb, pres., 491 East 27th St., taking bids on separate contracts 3 story, basement, brick, steel, plain found., 60-62 Bway. $150,000. J. Holt, 132 Market St., archt.

N. J., Paterson — THEATRE and STORE — Owner, c/o A. E. Sleight & Son, archts., 136 Washington St., revising plans and bids about July 15, general contract 1 story, basement, 75 x 100 ft., brick, steel, plain found., Market St. $150,000. Former bids rejected. Noted May 16.

N. Y., Brooklyn—STORE and RESTAURANT—See "Contracts Awarded."

N. Y., New York—HOUSE of DETENTION—July 29, by R. C. Patterson, Jr., comr. Correction, Dpt. Correction, Municipal Bldg., general contract House of Detention for Women, West 10th St., Greenwich and 6th Aves. Noted May 30.

N. Y., New York—OFFICE—See "Contracts Awarded."

N. Y., New York — STORAGE, STORE and OFFICE—H. Gilsay, Huntington, taking bids on separate contracts 10 story, 105 x 132 ft., brick, steel, 1193 Bway. $800,000. Shampan & Shampan, 188 Montague St., Brooklyn, archts. Noted June 28.

O., Akron—Trustees Y. W. C. A. Building Com., bids about Sept. 1, 10 story, basement, 100 x 143 ft., concrete, brick, steel, incl. auditorium, swimming pool and dormitories, High and Bowey Sts. $1,000,000. Fichter & Brooker, Metropolitan Bldg., archts.

Ore., Eugene—OFFICE—C. A. Houghtaling, archt., 326 Stark St., Portland, bids about Aug. 27, 9 story, basement, 100 x 160 ft., rein.-con., steel, plain found., Bway. and Olive St., for Amer. Trust Co., Portland. $365,000.

Pa., West Chester—THEATRE—Hoffman-Henon Co., archts., Finance Bldg., Phila., taking sub-bids 2 story, balcony, basement, 140 x 157 ft., brick, steel, plain found., for Warren Bros., 1222 Pine St., Phila.

Tex., El Paso—THEATRE—W. Scott Dunne, archt., Melba Bldg., Dallas, taking bids 4 story, 100 x 200 ft., brick, stone, rein.-con., concrete found., for Dent Theatres, Inc., 2009½ Jackson St., Dallas. $450,000. Noted June 13.

Contracts Awarded

Ala., Birmingham—CLUB—Jemison & Co., 221 North 21st St., 2 story, basement, 60 x 295 ft., brick, stone, stucco, rein.-con., in Mountain Brook Estates, to L. E. Ford & Co., Mountain Brook Village. $250,000.

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Buildings—Commercial (Continued)

Calif., Chico — MAUSOLEUM — Memorial Assn., Chico, rein.-con., to McGillivray Constr. Co., Folsom Blvd. and 65th St., Sacramento. $150,000.

Calif., Colma—RECEIVING VAULT—Italian Cemetery, rein.-con., to Mission Concrete Co., 270 Turk St., San Francisco. $200,000.

Calif., Hollywood — OFFICE and SALESROOM—C. E. Toberman, 2 story, basement, rein.-con. Orange Dr. and Hollywood Blvd., to Meyer & Holler, Wright-Callendar Bldg., Los Angeles. $200,000.

Calif., Oakland—STORE—Jackson Furniture Co., 4736 East 14th St., 3 story, concrete addition, to E. E. Leiter & Son, 811 37th St. $150,000.

Conn., Hartford — STORE — M. Cohn, 35 Westbourne Parkway, 4 story, 80 x 100 ft., brick, steel, Pleasant and Main Sts., to Cohen & Martin, East Hartford. Est. $150,000.

Conn., Windsor—BUSINESS—G. W. Christoph, Warehouse Point, 2 story, brick, steel, to Carlson & Torrell, Inc., 50 Dwight St., New Britain. Est. $150,000. Noted May 30.

Fla., Orlando — BANK and OFFICE — First Natl. Bank & Trust Co., W. R. O'Neil, pres., Pine St., 4 story, 76 x 87 ft., rein.-con., terra cotta, to G. W. Hessler Constr. Co., West Bldg., Jacksonville. Est. $300,000.

Ill., Cairo—THEATRE—General Theatre Co., I. W. Rogers, pres., 3 story, basement, 50 x 165 ft., rein.-con., brick, terra cotta, tile, to A. H. Gerhardt & Son, 633 Bway., Cape Girardeau, Mo.

Ill., Evanston—MEMORIAL—A. H. Knox, archt., 140 South Dearborn St., Chicago, general contract 3 story, 44 x 150 ft. with 26 x 30 ft. wing, to R. C. Wieboldt Co., 1412 West Washington Blvd., Chicago, for Sigma Alpha Epsilon, A. K. Nippert, secy., Cincinnati, O. Est. $300,000. Noted Apr. 25.

Ia., Sioux City—STORE and OFFICE—Jackson Street Building Corp., c/o A. M. Seff, secy., 524 Insurance Exch., store and office building, to B. E. Short, Sioux City. $800,000.

Mass., Boston — CLUB — University Club of Boston, 40 Trinity Pl., 2 story, basement, 75 x 150 ft., brick, steel addition, plain found., to Sawyer Constr. Co., Park Sq. Bldg. Est. $150,000.

Mass., Cambridge—CLUB—Cantabrigia Club, D. A. Harrington, pres., 1010 Mass. Ave., 2 story, basement, brick, concrete found., to J. H. McPherson, 3 Granite St., Quincy. Est. $150,000. Noted Feb. 21.

Mass., Maynard — BANK — Assabot Institute for Savings, C. H. Persons, pres., 1 story, basement, brick, limestone, concrete, steel, plain found., to C. S. Patten, 137 West Emerson St., Melrose. $150,000 or more. Noted June 27.

Mo., University—STORE and OFFICE—Delmar Loop Building Co., general contract 2 story, basement, rein.-con., brick, stone, terra cotta, Enright St. between Kingsland and Syracuse Sts., to Weinberg Constr. Co., 816½ Chestnut St., St. Louis. Est. $250,000.

N. J., Elizabeth—CLUB—Y. M. and Y. W. H. A., 1034 East Jersey St., general contract 2 story, basement, 80 x 150 ft., brick, steel, plain found., to F. J. Schnieder, 514 Jersey Ave. Est. $150,000. Noted May 5.

N. J., Newark — CLUB—W. E. Lehman, archt., 972 Broad St., general contract 4 story, basement, 100 x 100 ft., brick, steel, plain found., 37-41 Fulton St., to A. A. Fountain, Inc., Railroad Ave. and Beech St., Hackensack, for Progress Club, M. Scheck, pres., 11 Park St. Est. $500,000. Noted June 27.

N. J., Passaic—BANK and OFFICE—Amer. Natl. Bank of Passaic, 150 2nd St., general contract 2 story, basement, brick, steel, plain found., to E. Verduin, 480 East 34th St., Paterson. Est. $150,000. Noted June 13.

N. J., Westfield—STORE—C. H. Darsh (owner and archt.), Post Office Bldg., Cranford, general contract 2 story, basement, 50 x 125 ft., brick, steel, plain found., to G. Newmann & Sons, 814 Embree Crescent. Est. $150,000. F. W. Woolworth & Co., 233 Bway., New York, lessee. Noted Feb. 28.

N. Y., Brooklyn — STORE and MANUFACTURING — Ascutney Realty Corp., store and manufacturing, to W. Kennedy Co., 215 Montague St. Est. $1,000,000. Noted May 23.

N. Y., Brooklyn—STORE and RESTAURANT—Mauson Realty Corp., M. Ittleson, pres., 31-13 Ditmars Ave., Astoria, 2 story, 102 x 104 ft., brick, Coney Island Ave., separate contracts. $150,000. M. Klein, 65 Court St., Archt.

N. Y., New York—GARAGE—Kent Garage Investing Corp., 350 Madison Ave., 25 story, 100 x 140 ft., to F. T. Ley, 578 Madison Ave. Est. $1,400,000. Noted Nov. 8.

N. Y., New York—OFFICE—Brandish Johnson Estate, 50 Bway., 20 story, 93 x 103 ft., brick, steel, to W. F. Kenny Co., 114 5th Ave. Est. $1,000,000. Contractor taking bids on subcontracts. Noted June 28.

N. Y., New York—OFFICE—R. E. Simon, c/o J. G. Siegel, lessee, 343 Madison Ave., 19 story, 50 x 100 ft., 57th St. and Madison Ave., separate contracts. Buchman & Kahn, 2 Park Ave., New York, archts.

N. Y., New York—STORAGE, OFFICE and STORE—Abenad Realty Corp., A. N. Adelson, pres., 565 5th Ave., 32 story, 118 x 200 ft., brick, steel, to Shroder & Koppel, 420 Lexington Ave. Est. $2,000,000. Noted June 6.

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N. Y., New York—THEATRE and STORE—Highbridge Realty Co., c/o Loews Theatres, 1540 Bway., theatre and store, 4140 Bway., to Aronberg-Fried Co., 21 East 40th St. Est. $1,250,000.

O., Cleveland—POSTAL STATION—M. A. Bradley Estate, 1276 West 3rd St., 2 story, basement 102 x 109 ft., brick, rein.-con., to Bolton-Pratt Constr. Co., Columbia Bldg. Est. $150,000. Noted June 27.

Okla., Miami—BANK and OFFICE—First Natl. Bank, R. B. Bayless, pres., 6 story, 50 x 120 ft., rein.-con., granite, Indiana limestone, to St. Louis Bank Building & Equipment Co., 901 Sidney St., St. Louis, Mo. Est. $250,000.

Okla., Oklahoma City — THEATRE and OFFICE — J. Sinapoulo, 320½ West Grand St., general contract 10 story, basement, 65 x 225 ft., rein.-con., brick, to Reinhart & Donovan, Trades Natl. Bldg. Est. $500,000. Noted June 6.

Pa., Allentown — GARAGE — Central Motor Ramp Garage, Law and Court Sts., 4 story, basement, 100 x 122 ft., rein.-con., brick, steel addition, plain found., to Hughes Foulkrod Co., 1508 Race St., Phila. Est. $225,000.

Pa., New Castle—GARAGE—W. G. Eckles Co., archts., Lawrence Savings & Trust Bldg., 4 story, 150 x 160 ft., rein.-con., brick, to Hoyland & Frasso, Leasure St., for Lawrence Motor Co. Est. $150,000. Noted June 13.

Pa., Pittsburgh—AUDITORIUM—H. J. Heinz Co., 1062 Progress St., plans by Albert H. Kahn, Inc., 1600 Marquette Bldg., Detroit, Mich., superstructure 4 story, 100 x 360 ft., rein.-con., brick, steel, Progress and Heinz Sts. Excavation for same awarded, to R. M. Netherland Co., 1228 Ridge Ave. N.S. Noted May 23. Rein.-con. flooring and roofing, etc.

Pa., Pittsburgh—See "Unclassified."

R. I., East Providence (br. Providence) — HOME—Howe & Church, archts., Turks Head Bldg., Providence, 3 story, basement, 30 x 115 ft., and 125 x 235 ft. home for invalids, brick, plain founds., to A. W. Merchant, Inc., Hospital Trust Bldg., Providence, for Bradley Hospital. Est. exceeds $150,000. Noted May 2.

R. I., Newport—BANK—Aquidneck Natl. Com. Exch. Bank & Savings Co., 286 Thames St., 1 story, basement, brick, steel, rein.-con., plain found., to L. R. Porter Co., 197A Washington St., Salem, Mass. Est. $150,000.

Tex., Corpus Christi—THEATRE—R. R. Gulf Amusement Co., c/o H. H. Elliott, mgr., Corpus Christi, general contract 4 story, basement, 80 x 290 ft., rein.-con., brick, steel, plain found., to Wood Sherman P.O. Box 688,, $113,608. Noted June 13.

Tex., Dallas—STORE—A. A. Lander, 1 and 2 story, 100 x 140 ft., brick, stone, rein.-con., East Grand St., to Cowdin Bros., 1813 Main St.

Ont., Toronto — CUSTOMS — S. E. O'Brien, secy. Dpt. P. Wks., Parliament Bldgs., Ottawa, 5 and 6 story, basement, 238 x 389 ft., rein.-con., brick, stone, to Peter Lyall & Sons Constr. Co., 120 St. James St., Montreal, Que., for Dominion Govt., Ottawa. $2,000,000. Noted May 16.

Sask., Wayburn—HOSPITAL—City, new hospital, to Bird, Woodrill & Simpson, Regina. $365,000.

Buildings—Educational, Religious

Proposed Work

Calif., Berkeley—ENGINEERING—University of California plans by G. W. Kelham, 315 Montgomery St., San Francisco, college for electrical and mechanical departments, on campus. $685,000 (1st unit).

Calif., Los Angeles—CHURCH—University Religious Conference, A. Evans, chn., 4665 Willowbrook Ave., all religious building, Westwood Campus. $150,000. Engineer and architect not selected.

Calif., Los Angeles—TEMPLE and COMMUNITY CENTER—Temple Israel of Hollywood, 1904 North Argyle St., plans by Hauttman & Nordahl Co., 700 South La Brea Ave., 2 story, Spanish design, De Longpre and Jule Aves. $150,000.

Calif., Owensmouth — HIGH SCHOOL — Los Angeles School Dist., rebuilding fireproof high school, recently destroyed by fire. $300,000.

Calif., Pasadena—COLLEGE—Pasadena College sketches by Marsh, Smith & Powell, 514 Architects Bldg., Los Angeles, W. P. Shepherd, 15 South El Molino St., Pasadena, and Lansdowne Constr. Co., Santa Ana, College, incl. dormitories, library, science laboratories, special education facilities. $500,000.

Conn., Bristol—SCHOOL—Sixth School Dist., J. T. Donovan, chn., soon takes bids 2 story, basement, brick, plain found. $150,000. H. A. Hayden, 175 Main St., archt. Noted Jan. 17.

Conn., Norwich — GYMNASIUM — Norwich Free Academy, S. H. Palmer, sketches by Chandler & Palmer, Thayer Bldg., brick, steel, rein.-con. $150,000.

D. C., Wash.—BUSINESS HIGH SCHOOL—District Comrs., District Bldg., Business High School. $1,500,000. A. L. Harris, District Bldg., municipal archt.

Ill., Wheaton — CHURCH — Gary Memorial Methodist Episcopal Church plans by Childs & Smith, 720 North Michigan Ave., 2 story, irregular shaped, stone, Main St. and Wesley Ave. $300,000.

Ia., Cedar Rapids—LIBRARY—Coe College, H. Gage, pres., 1220 1st Ave., sketches rein.-con., brick, stone library. $250,000.

Me., Orono — UNIVERSITY — University of Maine, H. Boardman, sketches by Crowell & Lancaster, Exchange Bldg., Bangor, 3 story, basement, girls dormitory, home economics and infirmary buildings, library addition, brick, plain founds. To exceed $150,000.

Mass., Brookline—SCHOOL—Stone & Webster, Inc., engrs., 49 Federal St., Boston, soon lets contract 3 story, basement, 85 x 150 ft., brick, stone addition, plain found., Woodland St., for Beaver Country Day School, Inc., E. R. Smith, headmaster, 245 Woodland Rd. $150,000 or more. G. Allen, 73 Newbury St., Boston, archt.

Mass., Concord — DORMITORY — Middlesex School, F. Winson, rejected bids 4 story, basement, irregular sized, brick, plain found. $150,000 or more. Will readvertise. Strickland, Blodgett & Law, 20 Newbury St., Boston, archts. Noted June 27.

Mass., Danvers—HIGH SCHOOL—Town, new high school, Conant St. $325,000 appropriated. Engineer and architect not selected.

Mass., Needham—HIGH SCHOOL—Town, E. H. Allen, chn. building com., 44 Parkinson St., revised plans by R. C. Sturgess, 120 Boylston St., Boston, Senior High School, 3 story, basement, 100 x 300 ft., brick, stone, steel, plain found., incl. manuel training, science shops, assembly hall, Richwagon Hill. $420,000.

Mass., New Bedford — CHURCH — United Church, H. M. Hainer, pastor, 271 Maple St., church, Hawthorne St. To exceed $150,000. Engineer and architect not selected.

Mass., Somerville—SCHOOL—City, L. M. Conwell, mayor, City Hall, sketches by J. P. Hefferman, 175 High St., Boston, 2 story, brick, stone, Puritan and Putnam Rds. $150,000.

Mass., Stoneham—HIGH SCHOOL—Bd. Educ., F. W. Porter, supt., High School, 2 story, basement, brick, plain found., Wright St. $150,000. Engineer and architect not selected.

Mass., Worcester—HIGH SCHOOL—City, P. Building Dpt., City Hall, plans by G. A. Johnson, 16 Norwich St., Junior High School, brick, steel, incl. gymnasium, auditorium. Providence St. To exceed $150,000. Noted June 6.

Mich., Battle Creek—SCHOOLS—Bd. Educ. plans by Channel & Chute, 717 Post Bldg., two 2 story, basement, brick, steel, plain founds. $150,000.

Mich., Detroit—CHURCH—Trinity Evangelical Church, Rivard St. and Gratiot Ave., plans by W. E. N. Hunter, 1010 Donovan Bldg., 2 story, basement, concrete, brick, steel, stone, plain found., Rivard St.

Mich., Muskegon—NURSES HOME—Mercy Hospital, 1521 Jefferson Ave., plans by F. Forster, 240 Lyman Bldg., 4 story, basement, brick, steel, stone, rein.-con., plain found., Jefferson Ave. $400,000.

Neb., Omaha — COLLEGE — Sacred Heart Convent, c/o Mother Olivia, sketches by J. M. Nachtigall, Paxton Bldg., 3 story, basement, rein.-con., brick, stone, 36th and Burt Sts. $150,000.

N. J., Convent—NUN'S HOME—Myers, Bigelow & Shanley, archts., 24 Walnut St., Newark, revising plans and take bids about July 15. general contract 4 story, basement, brick, steel, plain found., for College of St. Elizabeth, Convent Station. $300,000. Noted June 27.

N. J., Highland Park (br. New Brunswick)—CHURCH—First Baptist Church, H. C. Wright, pastor, 307 Lawrence St., 2 story, basement, brick, steel, plain found., 2nd and Raritan Aves. $150,000.

N. Y., New York—MUSIC HALL and ASSEMBLY—American Academy of Arts & Letters, 633 West 155th St., plans by Cass Gilbert, 244 Madison Ave., 2 story, brick, steel, stone, 632 West 156th St. $600,000.

Okla., Bartlesville—SCHOOL—See "Contracts Awarded."

Ore., Eugene—MEDICAL SCHOOL—University of Oregon plans by Allen & Bean, Chamber of Commerce Bldg., Portland, 4 story, 100 x 100 ft., Marquam Hill. $400,000. Lawrence & Holford, Chamber of Commerce Bldg., Portland, engrs.

S. C., Greenville—SCHOOLS—School Trustees addition to high school, 8 classroom grammar school and other schools. Total $700,000.

Tex., Ft. Worth—CHURCH—W. G. Clarkson & Co., archts., 1st Natl. Bank Bldg., bids after July 17, 4 story, basement, brick, steel, rein.-con., stone, concrete found., 5th St. between Florence and Macon Sts., for First Methodist Congregation. E. B. Hawks, pastor. $500,000. Noted May 23.

Tex., Tyler—SCHOOLS—Bd. Educ. c/o Secretary, plans by Bryan & Sharp, 707 Const. Industrial Bldg., Dallas, 2 Junior High and Negro Ward Schools, addition to present ward school, repairing other schools. $325,000. Noted Apr. 25.

W. Va., Morgantown—LIBRARY—State Bd. Control, Charleston, soon takes bids 3 story, 144 x 150 ft., brick, stone. $300,000. Davis, Dunlap & Barney, 1805 Walnut St., Phila., Pa., archts. Noted Apr. 18.

Que., Laval de Rapids—HOME—Sisters of Good Shepherd, 67 Sherbrooke St., plans by I. E. Lalilierte, 180 Ontario St., East Montreal. $250,000.

Buildings—Educational, Religious (Cont.)

Que., Montreal—COLLEGE—Lower Canada College plans by G. D. Thompson, 2045 McGill College Ave., new buildings. $200,000.

Que., Montreal—COLLEGE—United Theological College, 3506 University St., plans by H. L. Featherstonbaugh, 1410 Stanley St., college. $275,000.

Que., Montreal—CONVENT—Sisters of Sacred Heart, Gouin Blvd., convent. $500,000.

Que., Montreal—HOME—Brothers of St. John, 84 Notre Dame St. W., plans by I. O. Marchand, 276 St. James St., old folks home. $500,000.

Que., Montreal—NURSES HOME—Homopathic Hospital plans by Ross & MacDonald, 1 Belmont St., nurses home, Northcliffe Ave. $200,000.

Que., Montreal—REFUGE—Refuge de Notre Dame de la Merci, 459 St. Paul St. E., refuge. $175,000.

Que., Montreal—SCHOOL—Roman Catholic School Comn., 87 St. Catherine St. W., school, Maisoneuve St. $180,000.

Que., Quebec City—MONASTERY—Hospite de la Hotel de Dieu, 11 Palace Hill, plans by Beaulne & Morrisette, 20 D'Ayuillon St., monastery. $500,000.

Bids Asked

Ala., Auburn — ANIMAL HUSBANDRY and DAIRY — July 15, by Alabama Polytechnic Institute, 3 story, basement, brick, concrete, steel, also cow barn. Warren, Knight & Davis, Protective Life Bldg., Birmingham, archts. Noted May 9.

Calif., San Diego—HIGH SCHOOL—July 29, by Bd. Educ., San Diego High School Dist., Hoover High School, brick, concrete. $350,000. Kistner & Co., Architects Bldg., Los Angeles, archts. Noted July 4.

Conn., New London—ATHLETIC—Harvard University, Harvard Athletic Assn., Quincy St., Cambridge, Mass., taking bids 5 units, incl. boathouse, crew and coach quarters, dining hall, clubhouse, all timber, Red Top, Thames River. $200,000. W. A. Platt, 101 Park Ave., New York, archt. Noted May 9.

Conn., West Hartford (br. Hartford) — SCHOOL—July 12, by R. F. Barker, archt., 15 Lewis St., Hartford, 2 story, basement, 65 x 225 ft., brick, steel, Charter Oak Dist., for Town, School Comn., Town Hall. $150,000. Noted June 6.

D. C., Wash.—SCHOOL—July 15, by District Comrs., District Bldg., Bell School. $175,000. A. L. Harris, municipal archt.

Ill., Quincy—HIGH SCHOOL—Bd. Educ., c/o J. C. Whitefield, Broadway Bank, bids about Aug. 1. 3 story, rein.-con., brick, stone, 14th St. between Maine and Jersey Sts. $500,000. Behrensmeyer & Haffner, Western Catholic Union Bldg., archts. Noted May 9.

Ind., Beaver Dam (mail Akron)—SCHOOL—July 25, by Kosciusko Co., 2 story, 100 x 120 ft., brick, steel, for School Comrs. $150,000. Bradley & Babcock, 221 West Wayne St., Ft. Wayne, archts.

Ind., Culver—SCHOOL—July 13, by Marshall Co., brick, steel, for School Comrs. $150,000. Bradley & Babcock, 221 West Wayne St., archts. Noted July 4.

Ind., Wolcottville—HIGH SCHOOL—July 15, by La Grange Co., high school. $150,000. Bradley & Babcock, 221 West Wayne St., Ft. Wayne, archts.

Ia., Cedar Rapids—SCHOOL—July 17, by Bd. Educ., C. D. Hedberg, secy., 2 story, part basement, 92 x 244 ft., brick, rein.-con., incl. 18 rooms, assembly hall, L Ave. and 11th St. $200,000. H. E. Hunter, Security Bldg., archt. Noted May 30.

Mass., Fall River—NURSES HOME—July 22, by Truesdale Hospital, D. S. Jones, supt. nurses, 1820 Highland Ave., altering and constructing 4 story, basement, 35 x 140 ft., brick, steel addition, plain found., Highland Ave. $150,000-$160,000. E. I. Marvell, 209 Bedford St., archt. Noted June 6.

Mass., Framingham—SCHOOL—Town, Chairman School Comn., 6 Beaumont St., taking bids 2 story, basement, brick, stone, Beacon St. and Cochituate Rd. $150,000. F. A. and F. M. Kendall, 45 Bromfield St., Boston, archts. Noted June 20.

Mass., Melrose—SCHOOL—City, H. H. Stuart, supt. schools, City Hall, taking bids 2 story, basement, 60 x 100 ft., brick, plain plain found., incl. auditorium, Lincoln St. $150,000. C. R. Greco, 11 Beacon St., Boston, archt. Noted Mar. 14.

Mass., Natick — SCHOOL — St. Patricks Church, M. F. Delaney, pastor, 30 East Central St., taking bids 2 story, basement, 85 x 145 ft., brick, plain found., East Central St. $150,000. T. E. Sheehan, 120 Boylston St., Boston, archt. Noted June 6.

Mass., Whitinsville — CHURCH — Christian Reformed Church, c/o G. E. Dorman, archt., 6 Beacon St., Boston, taking bids 1 story, basement, 75 x 100 ft., brick, stone, plain found. $150,000. Former bids rejected. Noted June 20.

Mich., Detroit—CHURCH—W. E. N. Hunter, archt., 1007 Donovan Bldg., bids about July 24, 3 story, brick, steel, stone, rein.-con., plain found., for Trinity Evangelical Church, 1345 Gratiot Ave., $250,000. Noted July 11.

Mich., Petoskey—SCHOOL—July 19, by R. D. Engle, secy. Bd. Educ., 2 story, basement, 158 x 183 ft., rein.-con., brick, steel, stone, plain found. $165,000.

N. J., Clifton — CHURCH — See "Contracts Awarded."

N. J., Kearny (sta. Arlington)—SCHOOL—Bd. Educ., Town Hall, bids about Aug. 1. 2 story, basement, brick, steel, rein.-con., plain found. $200,000. Guilbert & Betelle, 20 Branford St., archts. Noted Mar. 14.

N. J., Linden—HIGH SCHOOL—Bd. Educ., St. George Ave., bids about Sept. 2. 2 story, basement, brick, steel, plain found., Morris Ave. $200,000. H. B. Brady, 333 North Broad St., Elizabeth, archt. Noted June 13.

N. J., Newark—ORPHANAGE—L. Kasoff, archt., 164 Market St., bids about July 15, general contract 3 story, basement, brick, steel, plain found., 12 Homestead Park, for Daughters of Israel Hebrew Orphans Sheltering Institution, 121 Homestead St. $150,000. Noted June 28.

N. J., Riveredge—SCHOOL—Bd. Educ., Boro Hall, bids about Aug. 1. 2 story, basement, brick, steel, plain found. $200,000. E. Sibley, 1034 Edgewood Lane, Palisade, archt. J. L. Tillack, 173 Main St., Hackensack, assoc. archt. Noted June 20.

N. J., Trenton—CHAPEL—July 16 (extended date), by Dpt. Institutions & Agencies, State Office Bldg., 2 story, basement, brick, steel, plain found., on grounds State Home for Girls. $150,000. C. N. Leathem, Jr., Trenton, state archt.

N. Y., Brooklyn—SCHOOL—July 25, by W. C. Martin, archt., and supt. School Buildings, Flatbush Ave. extension and Concord St., general contract or general contract, lighting fixtures P. S. 208, Avenue D from East 48th to East 49th St., for Bd. Educ., 500 Park Ave., New York.

O., Columbus—PHARMACY and BACTERIOLOGY, etc.—July 31, by C. L. Steeb, secy. Ohio State University, 4 story, basement, 60 x 200 ft., concrete, brick, stone, on campus, $250,000; also 1 story, 60 x 100 ft. dining hall, kitchen on Lake Erie, Put-in-Bay, $25,000. J. N. Bradford, Ohio State University, archt.

O., Middletown—SCHOOLS—July 23, by Bd. Educ., R. Snyder, secy., two 3 story, basement, 175 x 300 ft., rein.-con., brick, steel, plain found., 11th Ave. and Central Ave. $750,000. T. McLaughlin, Lima, archt.

Pa., Phila.—COLLEGE and HOSPITAL—Womens Medical College, 21st St. and College Ave., taking bids 4 story, basement, 43 x 340 ft., two 43 x 68 ft. wings, rein.-con., brick, steel, plain founds., Abbottsford Ave. and Henry St. Ritter & Shay, Packard Bldg., archts.

Pa., Pittsburgh—SCHOOL—July 16, by Bd. Educ., Bellefield Ave., Madison Elementary School Addition, Milwaukee and Orion Sts. $278,000. T. Pringle & O. J. Robling, Fulton Bldg., archts. Noted May 23.

R. I., Providence—HIGH SCHOOL—July 22, by City, Pub. Building Dept., City Hall, taking bids Junior High School, brick, steel, stone, Chalkstone Ave. $1,000,000. T. J. H. Pierce, City Hall, archt. Noted Feb. 21.

Wash., Seattle—SCHOOL—F. A. Naramore, archt., Central Bldg., bids about Sept. 1. Ballard Intermediate School, 3 story, basement, brick, 18th N.W. and West 65th St., for Seattle School Dist. 1, Central Bldg. $600,000. Noted June 6.

Contracts Awarded

Calif., Oakland—HIGH SCHOOL—Oakland School Dist., 3 story, rein.-con. addition, to Crocker Highlands School, to J. E. Branagh, Walnut and Central Sts., $108,485.

Calif., Ventura—HIGH SCHOOL—Trustees Ventura Union High School Dist., 2 story, brick, steel, to J. F. Atkinson, 1102 Story Bldg., Los Angeles, $185,710.

Conn., Meriden — SCHOOLS — City, C. C. Thompson, supt. schools, Roger Sherman and John Barry Schools, brick, steel, each 4 rooms, general contract, to H. Wales Lines Co., 134 State St., $107,754. Noted Jan. 31.

Conn., New Haven — MEDICAL and PEDIATRICS — Bd. Trustees Yale University, brick, steel, stone, to Sperry & Treat, 294 Timberly St. Est. $1,000,000. Noted Mar. 14.

Conn., Windsor — SCHOOLS — Superintendent Schools, 4 room high school addition, 8 room grade school, 2 story, basement, brick, steel, to C. Smith & Sons, Inc., 101 Water St., Derby. Est. $150,000. Noted Dec. 13.

Mass., Brookline (br. Boston)—NURSES HOME—Free Hospital for Women, H. J. Ewin, supt., 80 Glen Rd., 3 story, basement, brick, plain found., Cumberland Ave., to L. D. Willcutt & Sons Co., 146 Summer St., Boston. Est. $150,000.

Mass., Haverhill—CHURCH, RECTORY and PARISH HOUSE—Trinity Episcopal Church, J. M. Smith, pastor, altering 2 and 3 story, basement, brick, stucco, to L. Killam, 65 Fleet St. Est. $150,000. Noted June 20.

Mass., Lawrence—HOME—Marist Brothers, Rev. H. DeLacheppello, St. Anne's Parish, 3 story, basement boys home, brick, plain found., Haverhill and West Sts., to L. Cyr, 45 Melrose St. Est. $150,000.

Mass., Lexington (br. Boston)—CHURCH—St. Bridget's Roman Catholic Church, W. J. McCarthy, pastor, 1 story, basement, 65 x 125 ft., brick, stone, plain found., to C. H. Marsolais, 54 Mass. Ave. Est. $150,000. Noted May 23.

Mass., Newton—SCHOOL—Fessenden School, 215 Albermarle Rd., 2 story, basement, brick, stucco addition and memorial hall, plain found., Albermarle Rd., West Newton, to C. C. Fulton & Sons, 8 Francis St., Milton. Est. $150,000 or more.

Mass., Stoughton—SCHOOL—Town, Superintendent Schools, 2 story, basement, brick, plain found., and gymnasium, to Bouvier-Brien Constr. Co., 189 Sayles St., Woonsocket, R. I. Est. $150,000.

Mass., Wellesley — ADMINISTRATION — Wellesley College, E. F. Pendleton, pres., 657 Washington St., administration building, college grounds, to L. D. Willcut & Sons Co., 146 Summer St., Boston. $1,250,000.

N. J., Clifton — CHURCH — J. C. Van Vlandren, archt., 140 Market St., Paterson, 2 story, basement, brick, steel, plain found., Vernon Ave. and East 7th Sts., separate contracts, for Lakeview Heights Reformed Church, c/o architect. $150,000. Former bids rejected. Noted Apr. 4.

N. J., Passaic—SCHOOL—J. F. Kelly, archt., Post Office Bldg., general contract 2 story, basement, brick, steel, plain found., to Malcom Constr. Co., Inc., 57 Farnham Ave., Garfield, for Slovak Catholic Sokol, c/o architect. Noted May 9.

N. Y., Astoria (sta. Long Island City)—SCHOOL—Bd. Educ., 500 Park Ave., New York, general contract P. S. 141, to J. Kennedy & Co., 1133 Bway., New York, $510,800; plumbing, to W. J. Endres, Inc., $24,224; heating, to Pyro Heating Co., 11 West 42nd St., New York, $84,490; electrical work to Cleveland & Ryan, Inc., 175 5th Ave., New York, $18,900. Grand total $638,414. Noted June 20.

N. Y., Elmhurst — CHURCH — St. Bartholomew's Roman Catholic Church, 166 Utica St., church, to T. G. Sperling, 103 Park Ave., New York, $150,000. Noted June 20.

N. Y., Hamilton — LABORATORY — Colgate University, chemistry laboratory, McGregory Hall, to Waldo Griffiths Co., Mayro Bldg., Utica. $368,000.

N. Y., New York — NURSES HOME — St. Marks Hospital, 175 2nd Ave., 9 story, brick, steel, to Dwight P. Robinson Co., 125 East 46th St. Est. $425,000. Noted Mar. 28.

N. Y., New York—SCHOOL and CONVENT—Church of St. Margaret, T. J. Doyle, pastor, 2 story, 72 x 130 ft., brick, to J. J. McMahon, 40 East 49th St. Est. $200,000. Noted July 4.

N. Y., Peekskill—HIGH SCHOOL—Bd. Educ., 2 story high school, to Fulroy Constr. Co., Croton on Hudson. Est. $700,000. Noted June 20.

N. Y., Richmond Hill—SCHOOL—Bd. Educ., 500 Park Ave., New York, general contract P. S. 100, to J. Weinstein Bldg. Corp., 1302 Ocean Parkway, Brooklyn, $478,744. Noted June 13.

O., Toledo—SCHOOL—Bd. Educ., for De Veaux Pk. School, brick, steel, plain found., to G. Hannan, Bowling Green, $199,236.

Okla., Bartlesville—SCHOOL—Bd. Educ., 2 story, basement, brick, rein.-con. additions to Jefferson, Horace Mann and Lincoln Schools, general contract, to Universal Constr. Co., Coffeyville, Kan., $27,564; heating and plumbing, to Bartlesville Heating & Plumbing Co., Bartlesville, $21,703. Bids rejected on Washington and Garfield Schools. Noted June 6.

Pa., Pittsburgh—CHURCH—G. W. Larson, archt., 612 Fordham St., general contract 2 story, basement, 90 x 115 ft., stone, Wylie and Devilleis Sts., to W. B. Hartley Constr. Co., 137 East 8th Ave., Homestead, for Ebenezer Baptist Congregation, P. J. King, pastor, 9 Junilla St. Est. $250,000.

Tex., Waco—DORMITORY—Baylor University general contract women's dormitory, to S. B. Swigert & Co., Waco, $246,500; heating water system, to Hill Bros. & Co., Waco, $55,850. Noted June 6.

Ont., Guelph — HORTICULTURAL — Ontario Agricultural College, general contract 2 story, brick, stone, steel, to E. P. Muntz & Co. Ltd., Temple Bldg., Toronto; structural steel, to London Structural Steel Co., Burslem St., London; cut stone, to Arthur Stead, 148 Central St.

Federal Government Work

Proposed Work

Calif., Richmond—DREDGING—U. S. Engineer Office, San Francisco, 703,165 cu.yd. in Richmond Harbor.

D. C., Wash.—EMBASSY—French Government, 2460 16th St. N.W., sketches embassy building, 15th St. opposite Meridian Park. $1,000,000.

Ill., Keithsburg—LEVEE—U. S. Engineer Office, Rock Island, repairing 2 breaks in levee, near here.

La., New Orleans—LEVEE—U. S. Engineer Office, Atchafalaya River Levee.

Michigan—DREDGING—U. S. Engineer Office, Old Custom House, Detroit, rejected bids May 25, in Rouge River. Noted June 13.

Mich., Mt. Clemons — HEADQUARTERS BUILDING — Constructing Quartermaster, Selfridge Field, rejected bids June 14, at Selfridge Field. Noted May 30.

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Federal Government Work (Continued)

Mich., Port Huron—DREDGING—U. S. Engineer Office, Detroit, 18,500 cu.yd. Black River.

N. Y., Mineola — HANGARS — Constructing Quartermaster, rejected bids June 14, various buildings at Mitchell Field. Noted July 4.

N. C., Wilmington—REPAIRING—U. S. Engi- and Custom House; adv. E. N.-R. July 11.

Pa., Pittsburgh—TOWBOAT—U. S. Engineer Office, one 120 hp. direct Diesel sternwheel towboat.

Va., Norfolk—REPAIRING—U. S. Engineer Office, rejected bids repairing dredge Chinook.

Bids Asked

Delaware—DREDGING—July 18, by U. S. Engineer Office, Wilmington, 22,500 cu.yd. from entrance channel, Murderkill River; adv. E. N.-R. July 11.

Del., Wilmington—MOORING DOLPHINS—Aug. 5, by U. S. Engineers Office, 16 mooring dolphins along Chesapeake & Delaware Canal; adv. E. N.-R. July 11.

Fla., Sanford—HEATING, etc.—July 25, by Treas. Dpt., at office Supervising Archt., Wash., D. C., heating system and plumbing changes at U. S. Post Office.

Ill., Murphysboro—WATER SUPPLY—July 26, by Treas. Dpt. at office Supervising Archt., Wash., D. C., water supply piping in U. S. Post Office.

Kan., Leavenworth—DIKES, etc.—July 20, by U. S. Engineer Office, Kansas City, Mo., 3,000 lin.ft. standard pile clump dikes, 13,600 lin.ft. standard revetment in Missouri River at Delaware Bend, 6.7 mi. from here.

N. Y., Brooklyn—POST OFFICE—July 30, by Treas. Dpt., at office Supervising Archt., Wash., D. C., constructing foundations for extension to U. S. Post Office, Court House, J. A. Wetmore, acting supervising archt. Noted Feb. 14.

N. C., Wilmington—TUG—Aug. 10, by U. S. Engineer Office, 65 ft. 6 in. steel, diesel driven tug; adv. E. N.-R. July 11.

N. D., Fargo—POST OFFICE, etc.—Aug. 12, by Treas. Dpt. at office Supervising Archt., Wash., D. C., 3 story, basement, stone faced fireproof post office, court house, J. A. Wetmore, acting superv. archt.; adv. E. N.-R. July 11.

O., Cincinnati — QUARTERS — Aug. 2, by Treas. Dpt., at office Supervising Archt., Wash., D. C., additional quarters at U. S. Post Office and Custom House; adv. E. N.-R. July 11.

Wash., Ellensburg—EARTHWORK—Spec. 496—Aug. 9, at office Bureau Reclamation, earthwork, canal lining, tunnel, structures on Div. 2, North Branch Canal, Kittitas Div., Yakima Project; adv. E. N.-R. July 11.

Bids Received

California — ROAD — C. H. Sweetser, dist. engr. Bureau P. Rds., 461 Market St., San Francisco, grading 4.58 mi. Sect. 4-C, Route 1, Lassen Volcanic Natl. Park, Tehama Co., from A. J. and J. L. Fairbanks, South San Francisco, $68,273. Noted June 13.

D. C., Wash.—ELEVATOR—P. Buildings & P. Wks., Dpt., Wash., D. C., replacing elevator fronts in 2 elevators in State War and Navy Bldg., from Haughton Elevator & Machine Co., Vermont Bldg., $9,880.

D. C., Wash.—GRANITE—Executive Officer Arlington Memorial Bridge Comn., Navy Bldg., June 26, granite for Arlington Memorial Bridge, from J. Swenson Granite Co., Concord, N. H. $139,430, $136,430 or $313,810. Noted June 6.

D. C., Wash.—POWER PLANT—U. S. Government, D. Lynn, archt., Capitol, annex, from Schneider Spliedt Co., 2015 Rhode Island Ave. N. E., $49,240.

Ind., Richmond—REMODELING—Treas. Dpt., at office Supervising Archt., Wash., D. C., July 2, Post Office, from Dunlop & Co., Columbus, $21,361. Noted June 27.

N. Y., Fort Niagara—ADDITIONS—Constructing Quartermaster, additions to post hospital, from Walter S. Johnson Building Co., Sugar and Seneca Aves., Niagara Falls, $19,278.

Pa., Middletown — HANGAR — Constructing Quartermaster, hangar and utilities, from Martin & Frownfelter, Inc., Camp Hill, Pa., $35,990.

Tex., Taylor—POST OFFICE—Treas. Dpt., at office Supervising Archt., Wash., D. C., Post Office, from Kellogg & Anderson, Des Moines, Ia., $96,380. Noted May 30.

Contracts Awarded

Calif., Los Angeles—DREDGING—U. S. Engineer Office, in Los Angeles Harbor, to Frank Constr. Co., 260 California St., San Francisco, $193,700. Noted May 9.

D. C., Wash.—ALTERATIONS—Bureau Yards & Docks, Navy Dpt., Wash., D. C., altering heating plant at U. S. Marine Base, to Federal Heating Co., 426 Bond Bldg., Wash., D. C., $14,166 (100 days). Noted June 13.

D. C., Wash.—RIP RAP STONE—U. S. Engineer Office, rip rap stone for seawall foundation in Potomac River, to Smoot Sand & Gravel Corp., 300 K St., $31,790.

D. C., Wash.—REFLECTING POOL—P. Buildings & P. Parks, repairing reflecting pool, at Lincoln Memorial, to Rose Bros. Co., 2120 Georgia Ave. N.W., $49,911.

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Fla., Jacksonville—DISCHARGE PIPE—U. S. Engineer Office, hammer welded suction and discharge pipe for dredge Welatka, to Power Piping Co., 829 Beaver Ave., Pittsburgh, Pa., $7,041.

Ga., Fort Benning—ROADS, etc.—Constructing Quartermaster, roads, walks, to Davis Constr. Co., Walton Bldg., Atlanta, $31,000.

Ga., Savannah—DREDGING—U. S. Engineer Office, at Oyster Bed Island, to Arundel Corp., Pier 2, Pratt 2, Baltimore, Md., $185,686; Kings Island, to Globe Dredging Co., 204 West Bay St., $26,141; in Savannah Harbor, by government plant. Noted June 6.

Illinois—DIKES—U. S. Engineer Office, Custom House, St. Louis, Mo., 1,200 lin.ft. piling dikes, penitentiary point, to Kansas City Bridge Co., 510 Orear-Leslie Bldg., Kansas City, Mo., $47,454; 5,600 lin.ft. Brooks Point, to Woods Bros. Constr. Co., Lincoln, Neb., $240,845; 1,000 ft. Eliza Towhead, to W. P. McAcorge, Pine Bluff, Ark., $48,989; 2,200 lin.ft. Swift Sure Towhead, by government labor. Noted June 13.

Illinois—DREDGING—U. S. Engineer Office, 537 South Dearborn St., Chicago, Sect. 4, Illinois River, to R. C. Huffman, Terminal Tower, Cleveland, O., $828,664. Noted May 20.

Ill., Oak Park—WORK ROOM—Treas. Dpt., at office Supervising Archt., Wash., D. C., extending work room at U. S. Post Office, to Desmond & Son, Oak Park, $3,600. Noted June 26.

Ia., Knoxville—ACUTE BUILDING, etc.—U. S. Veterans' Hospital, Arlington Bldg., Wash., D. C., acute building, to Ganley Bros., 508 Endicott Bldg., St. Paul, Minn., $238,100; elevator, to Haughton Elevator & Machine Co., Vermont Bldg., Wash., D. C., $6,589. Noted July 4.

La., Carville—FENCE, etc.—Treas. Dpt., at office Supervising Archt., Wash., D. C., fences, approaches, at Marine Hospital, to LaBlanc & Barbey Co., St. Gabriel, $28,787. Noted July 4.

Md., Aberdeen Proving Ground—MAGAZINE BUILDINGS — Constructing Quartermaster, 16 magazine buildings, to R. G. Hopkins, 904 East 41st St., Baltimore, $49,937. Noted June 6.

Mass., Charleston—FENCE—Spec. 5895—Bureau Yards & Docks, Navy Dpt., Wash., D. C., ornamental iron fence, at Navy Yard to Burtman Ornamental Iron & Wire Wks., 93 Heath St., Roxbury, $9,570; other work, to Simpson Bros. Corp., 77 Summer St., Boston, $23,000.

Mass., Hingham—REROOFING—Spec. 5930—Bureau Yards & Docks, Navy Dpt., Wash., D. C., reroofing buildings at Naval Ammunition Depot, to Ormsby Roofing Co., 167 West 5th St., South Boston, $14,980 (45 days).

Mass., Woods Hole — CRIB BULKHEAD — Coast Guard, crib bulkhead, at Coast Guard Station, to F. C. Taylor, Fairhaven. Est. $20,000.

Michigan—DREDGING—U. S. Engineer Office, Detroit, Maumee River and Bay Channel, to Central Dredging Co., 307 North Michigan Ave., $409,836; 3 sections Intracoastal Waterway, Vermillion to Mermentsu Rivers, to Sternberg Dredging Co., Arcade Bldg., St. Louis, Mo., $81,000. Noted May 30.

Mich., Mount Clemons—DRAINS—Constructing Quartermaster, Selfridge Field, installing drainage system, to R. D. Baker, Outer Dr., $102,849. Noted May 30.

Mississippi and Louisiana — LEVEE — U. S. Engineer Office, Vicksburg, Miss., 5,400,000 cu.yd. levee work in Mississippi River, to Orleans Dredging Co., 747 Canal Bldg., New Orleans, La., $1,191,250. Noted May 23.

Nev., Hawthorne—ADMINISTRATION, etc.—Spec. 5835—Bureau Yards & Docks, Navy Dpt., Wash., D. C., buildings at Naval Ammunition Depot, to Mittry Bros., Constr. Co., 723 Detwiler Bld., Los Angeles, Calif., $1,090,400. Noted July 4.

N. J., Oceanport—ENTRANCE ROAD—Constructing Quartermaster, concrete main entrance road, to S. S. Thompson & Co., Red Bank, $10,600.

N. J., Picatinny Arsenal (mail Dover)—BAG LOADING AREA BUILDINGS—Constructing Quartermaster, 13 buildings at powder factory, to Van Adslen Constr. Co., Insurance Co. of North America Bldg., Phila., Pa., $49,927. Noted May 23.

N. M., Fort Stanton—ENGINE and GENERATOR—Treas. Dpt., at office Supervising Archt., Wash., D. C., additional engine and generator at Marine Hospital, to Randsome & Anderson, 136 Liberty St., New York, $12,932. Noted June 28.

N. Y., Buffalo—BREAKWATER—U. S. Engineer Office, repairing 1,710 lin.ft. breakwater, to F. A. Hanssel, Ellicott Sq. Bldg., $66,084.

N. Y., Mineola—BARRACKS—Constructing Quartermaster, Mitchell Field, 2 air corps barracks, to J. McWilliams, Inc., 11 East 44th St., New York, $273,920. Noted May 30.

N. Y., Mineola — RUNWAY — Constructing Quartermaster, runway, at Mitchel Field, to Gifford Constr. Co., 161 Jamaica Ave., Jamaica, $4,400.

N. Y., New York—ALTERING—Treas. Dpt., at office Supervising Archt., Wash., D. C., altering appraisers stores, to Bellis Wire Wks., 307 Scholes St., Brooklyn, $2,445.

O., Chillicothe—DRAINAGE WORK—U. S. Veterans' Bureau, Arlington Bldg., Wash., D. C., at U. S. Veterans' Hospital, to W. E. McGee & Son, Chillicothe, $14,867. Noted June 27.

O., Cincinnati—BARGES—U. S. Engineer Office, 2 to 5 steel barges delivered at Fernbank, to Dravo Contg. Co., Neville Island, Pittsburgh, Pa., $37,000.

Pa., Contesville—HOSPITAL—U. S. Veterans Bureau, Arlington Bldg., Wash., D. C., general contract hospital at U. S. Veterans Hospital, to A. C. Samford, 301 Washington St., Montgomery, Ala., $1,184,230; plumbing, to B. Grunwalk, 1110 Farnum St., Omaha, Neb., $155,900; heating, to J. L. Powers, Bennettsville, S. C., $176,332; electrical work, to Keystone Eng. Co., Reading, Pa., $63,900; radial brick chimney, to M. W. Kellogg Co., 225 Bway., New York, $7,777; ice making and refrigerating machinery, to York Ice Mchy. Co., 2222 Arch St., Phila., Pa., $20,384; steel water tank, to Pittsburgh-Des Moines Steel Co., 429 Pennsylvania Ave., Pittsburgh, $15,760. Grand total $1,624,283. Noted June 27.

Pa., Pittsburgh—GARAGE—U. S. Engineer Office, 3 single story, brick, for Ohio River Storage Depot, to Nagel & Ague, Sewickly, $2,387. Noted May 30.

Pa., Pittsburgh—CASTINGS—U. S. Engineer Office, steel castings, to Union Steel Co., 62nd and Butler Sts. $25,745.

Pa., Sharpsburg—ELEVATOR MACHINE—U. S. Veterans' Bureau, Arlington Bldg., Wash., D. C., Elevator Machine 2 in infirmary building U. S. Veterans' Hospital, Aspinwall, to Westbrook Elevator Mfg. Co., Danville, Va., $2,600.

S. C., Paris Island—INCINERATOR—Specs. 5894, 5871 and 5905—Bureau Yards & Docks, Navy Dpt., Wash., D. C., incinerator chimney and flue at Marine Base, to Jarvis Eng. Co., 51 Ellery St., Boston, Mass., $9,117 (120 days); wells, to Layne Atlantic Co., S.A.L. Bldg., Norfolk, Va., $11,839 (180 days); remodeling boiler plant, to Fanning & Sweeney, Inc., Greensboro, N. C., $11,488 (120 days); overhead electric distributing system at Marine Barracks, ot Carter-Alrich Electric Co., 507 Broad St., Augusta, Ga., $17,766 (150 days). Grand total $50,210. Noted June 30.

Tex., El Paso—ELEVATOR—Treas. Dpt., at office Supervising Archt., Wash., D. C., freight elevator in Post Office, to Otis Elevator Co., 810 18th St. N. W., $3,865—mailing platform, elevator hoistway, to H. T. Ponsford & Son, 914 East Missouri St., $7,970. Noted June 27.

Vt., Burlington—REMODELING—Treas. Dpt., at office Supervising Archt., Wash., D. C., remodeling, enlarging U. S. Post Office, to C. H. Holmes Constr. Co., 67 Bonair St., Somerville, Mass. Noted May 23.

Va., Hampton Roads (br. Norfolk)—REROOFING—Spec. 5900—Bureau Yards & Docks, Navy Dpt., Wash., D. C.; Buildings 104 and 106, Naval Operating Base, to Philip Carey Co., 916 D St. N. W., Wash., D. C., $11,390 (45 days).

Va., Langley Field — BOILER HOUSE and GARAGE — Natl. Advisory Com. for Aeronautics, boiler house, garage, to Virginia Eng. Co., Newport News, $25,740 and $25,390 respectively.

Va., Norfolk—BREAKWATER—Treas. Dpt., at office Supervising Archt., Wash., D. C., concrete breakwater, to A. H. Bell, Dickson Bldg., Norfolk, $11,000. Noted May 30.

Utah, Fort Douglas—HOUSE and GARAGE—Constructing Quartermaster, caretakers house with garage, to Alston & Hoggan, Beason Bldg., Salt Lake City, $6,940.

Alaska — ROADS — U. S. Bureau P. Rds., Juneau, constructing 0.53 mi. Kenai Hy., to Wright Constr. Co., Aberdeen, Wash., $25,996.

Unclassified

Proposed Work

SUBDIVISION DEVELOPMENT — **Pueblo, Colo.**—Fairview Heights Realty Co., c/o R. A. Smith, 6th and Main Sts., surveys sewers, curbing, guttering, gas, water, electricity, street and 200 residences between Norwood and LaCrosse Aves. and East 14th and East 16th Sts.

SWIMMING POOL—**Miami Beach, Fla.**—Fisher Properties, swimming pool, Nautalis Hotel grounds. Fisher Properties Eng. Dpt., Miami Beach, archts. and engrs.

GOLF COURSE—**Joliet, Ill.**—Park Bd., D. Mateer, pres., 27 hole golf course, club house, on 130 acre site 4 miles west on Troy Rd.

ATHLETIC FIELD IMPROVEMENTS — **Everett, Mass.**—City, C. C. Nichols, chn. com., soon takes bids improving athletic field, Chelsea St. $30,000 appropriated. Higgins & Collins, 316 Essex St., Lawrence, engrs.

BUS TERMINAL — **New Bedford, Mass.** — Union St. R.R. Co., Elton St., receiving sketches 1 story, brick, steel bus terminal. $25,000 or more.

BATHING BEACH—**Oak Bluffs, Mass.**—Town, Bd. Selectmen, developing beach for bathing purposes, large number bathhouses, new rafts, electric lights, walks. $25,000. Private plans.

REPEATER STATION — **Chesterton, Ind.** — Amer. Telephone & Telegraph Co., 195 Bway., New York, bids early in August, general contract repeater station addition. J. F. Steele, c/o owner, archt.

GRAIN ELEVATOR—**Port Huron, Mich.**—Canadian Natl. R.R., New Union Sta., Toronto, T. T. Irving, ch .engr, 2,000,000 bu. concrete grain elevator.

STADIUM—**University** (mail St. Louis), **Mo.**—Washington University, Forsythe and Skinker Blvds., St. Louis, will not construct rein.-con. stadium, Big Bend and Forsythe Blvds. $450,000. Project temporarily abandoned. Noted June 28, 1928.

Unclassified (Continued)

GRADE CROSSING ELIMINATION—**Bethlehem, N. Y.**—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, eliminating grade crossing, on Elsmere-Bethlehem Center County Hy. 1184, with rein.-con. paving $68,300, or bituminous macadam paving $85,300.

BATHS, etc. — **Midland Beach** (sta. Staten Island), **N. Y.**—Graham Midland Beach, 84 x 193 ft. baths, Lincoln Ave. and Boardwalk. $40,000. F. Wall, c/o owner, archt.

ATHLETIC FIELD — **Fort Lee, N. J.** — Bd. Educ., Municipal Bldg., athletic field, high school grounds, Palisade Ave. $50,000. McClave & McClave, 600 Gorge Rd., Cliffside Park, boro engrs.

GRADE CROSSING ELIMINATION—**Belfast, N. Y.**—Erie R.R. Co., R. C. Falconer, ch. engr., 50 Church St., New York, and Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad St. Station, Phila., Pa. bridge over Black River for eliminating grade crossing 100 ft. west Rockville Station. $61,600.

GRADE CROSSING ELIMINATION — **Malta, N. Y.**—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, bridge to carry railroad over Clifton-Park-Round Lake Co. Hy.

GREENHOUSE—**Toledo, O.**—Ohio Rose Co., Chamber of Commerce, 28 units, 40 x 300 ft. greenhouse, Oregon Rd. $100,000. Private plans.

PIPE LINE, REFINERY, etc.—**Abilene, Tex.**—Mid-Tex Oil & Gas Co., Mid-Tex Refining Co., Mid-Tex Pipe Line Co., c/o J. Sloan, pres., 35 mi. 2- to 4-in. pipe line near here. Private plans.

CARBON BLACK PLANT—**Borger, Tex.**—Eastern Carbon Black Co., Kanawha, Natl. Bank Bldg., Charleston, W. Va., preliminary surveys 2 carbon black plant units for Rock Creek plant, 3 mi. southwest of here. Private plans.

SEAWALL, PIER, etc.—**Pt. Arthur, Tex.**—City, c/o J. W. O'Neal, mayor, election soon $1,500,000, incl. 4 mi. seawall, $250,000; filling in Thomas Blvd. ditch; $750,000 pleasure pier; $500,000 bridge.

NATATORIUM—**Manitowoc, Wis.**—Bd. Educ. plans by Hamilton, Fellows & Neved, 814 Tower Court, Chicago, Ill., brick natatorium, South 8th St. $85,000.

TERMINAL ELEVATOR—**Calgary, Alta.**—West Coast Grain Co., terminal elevators. $150,000.

GRAIN ELEVATOR—**Hamiota, Man.**—Western Canada Flour Mills Co., elevator. $50,000.

ELEVATOR—**Russell, Man.**—United Grain Growers Ltd. elevator. $100,000.

SUBWAY—**Brantford, Ont.**—City and Canadian National Ry., C. S. Gzowski, ch. engr., (constr.), Montreal, Que., and subway, George St. crossing. $250,000. F. P. Adams, City Hall, engr.

SUBWAY—**Burlington, Ont.**—Dpt. P. Hys., Parliament Bldgs., Toronto, A. A. Smith, ch. engr., concrete, steel subway on Niagara Falls Hy. $100,000.

ELEVATOR—**Kingston, Ont.**—Canada Steamship Lines Ltd., 9 Victoria Sq., Montreal, Que., plans by C. D. Howe, 712 Whalen Bldg., Port Arthur, 1,300 ft. rein.-con. grain elevator, 200 ft. high, 4 travelling marine legs, Little Cataraqui Bay. $2,000,000. Noted June 6.

GAS HOLDER TANK—**Kitchener, Ont.**—P. Utilities Comn., King St. W., 250,000 cu.ft. gas holder tank, steel. $40,000. V. S. McIntyre, King St. W., engr.

TRANSMISSION LINE — **Toronto, Ont.** — Toronto Hydro Comn., 225 Yonge St., 4 mi. high tension steel tower transmission line between Leaside Substation and new substation on Yonge St. at Blythwood Rd. $400,000. Private plans.

Bids Asked

LIGHTING SYSTEM—**Oakland, Calif.**—F. C. Merritt, city clk., taking new bids street lighting system in Grand and Lake Park Aves. Former bids rejected. Noted May 23.

TANK, etc.—**Lakeville, Mass.**—July 15, by Dpt. P. Health, furnishing, erecting 75,000 gal. flat bottom steel suction tank with necessary heating equipment, found., at Lakeville State Sanatorium. G. H. Bigelow, comr.

SWIMMING POOL—**Lexington, Mass.** (br. Boston)—Town, Bd. Selectmen, taking bids concrete swimming pool, Parker Field Playground. $25,000. Private plans. Noted Mar. 14.

ATHLETIC FIELD—**Woburn, Mass.**—July 15, by City, and W. H. Punchard, landscape archt., 19 Arlington St., Boston, improving athletic field, on high school grounds. $30,000. J. McDermont, city engr.

PLAYGROUNDS—**Newark, N. J.**—Bd. Educ., City Hall, bids about July 15, grading, cement sidewalks, fence, field house, flag pole at Franklin School, 42 Park Ave., $25,000. Former bids rejected. H. J. and J. V. King, 222 Market St., engrs.

CELL BLOCK—**Auburn, N. Y.**—July 30, by Dpt. Correction, 11 North Pearl St., Albany, cell block, Auburn Prison; adv. E. N.-R. July 11.

STANDPIPE—**Babylon, N. Y.**—July 26, at office Long Island State Park Comn., 150 ft. steel standpipe, at Jones Beach State Park, A. E. Howland, ch. engr.; adv. E. N.-R. July 11.

SUBWAY PORTAL—**Long Island City, N. Y.**—July 16, by Bd. Transportation, J. H. Delaney, chn., 49 Lafayette St., New York, reconstructing subway portal at Amity and Lawrence Sts., Queens Boro.

PARK IMPROVEMENTS—**Long Island City, N. Y.**—July 16, by Park Dpt. W. R. Herrick, pres. Park Bd., Arsenal Bldg., Central Park, New York, sidewalks along main drive from Union Turnpike to Metropolitan Ave., reconstructing approaches to bridges carrying main drive in Forest Park.

FIREBOAT—**New York, N. Y.**—July 13, by J. J. Dorman, comr. Fire Dpt., Municipal Bldg., building, delivering steel gasoline-electric fireboat.

MECHANICAL EQUIPMENT—**Richmond Hill, N. Y.**—July 15, by W. C. Martin, archt. and supt. School Building, Flatbush Ave. extension and Concord St., Brooklyn, mechanical equipment, incl. plumbing, drainage, heating, ventilating, electrical work, lighting fixtures for P. S. 100, 111th Ave. and 118th St., for Bd. Educ., 500 Park Ave., New York.

UNDERPASS—**Ft. Worth, Tex.**—City, O. E. Carr, mgr. and Chicago, Rock Island & Pacific R.R. Co., W. H. Petersen, ch. engr., Chicago, Ill., bids after July 10, rein.-con. underpass at East 4th St. at railway crossing. $150,000. This corrects report in July 4 issue.

GRADE SEPARATION—**Milwaukee, Wis.**—See "Streets and Roads."

TRAFFIC SIGNALS — **Kingston, Ont.** — July 17, by W. W. Sands, clk., City Hall, traffic signal system on Princess St., electric lights, control boxes. $25,000. H. S. Dick, City Hall, engr.

PONTOON GATE LIFTER—**Ottawa, Ont.**—Aug. 13, by J. W. Pugsley, secy. Dpt. Railways & Canals, 500 ton steel pontoon gate lifter, Welland Ship Canal; adv. E. N.-R. July 11.

FOG ALARM—**Quebec**—July 16, by Dpt. Marine & Fisheries, Ottawa, Ont., rein.-con., fog alarm, dwelling, lightouse on rein.-con. pier, on North Channel, below Quebec. $85,000. L. E. Cote, Dpt. Marine & Fisheries, Ottawa, Ont., engr.

Contracts Awarded

ICE HOUSE and DOCK—**Ordway, Colo.**—Missouri Pacific R.R. Co., Ry. Exch. Bldg., St. Louis, Mo., ice house, icing dock, to Arthur & Allen, 409 North Grand Ave., Pueblo, $50,000.

GAS MAIN and REGULATOR STATION—**Pueblo, Colo.**—Pueblo Gas & Fuel Co., c/o A. M. Talbott, 122 West 5th St., 2 mi. 10 in. steel pipe line from intake gates to south side, $35,000. Owner builds. L. F. Babcock, 122 West 5th St., engrs.

SWIMMING POOL—**Hartford, Conn.**—Concrete swimming pool, pipe intake, outlet, to Foundation Constr. Co., 50 State St., $15,000. Noted May 30.

CULVERTS—**Le Mars, Ia.**—See "Streets and Roads."

PIPE LINE and COMPRESSOR STATION—**Louisiana**—Arkansas Natural Gas Corp., Shreveport, 100 mi. 20 in. gas pipe line from Monroe gas fields to Shreveport, to William Bros., 302 South Cheyenne, Tulsa, Okla., gas compressor station at Sterlington, to Republic Constr. Co., Woolworth Bldg., New York. Noted June 6.

PARK IMPROVEMENTS—**Boston, Mass.**—Park Dpt., 33 Beacon St., filling in Back Bay Fens, to A. G. Tomasello & Son, 250 Stuart St., $25,775. Noted June 13.

TRACK WORK—**Boston, Mass.**—Transit Dpt., 1 Beacon St., special track work, freight prepaid, f.o.b. cars, for Dorchester Rapid Transit, to Barbour-Stockwell Co., 205 Bway., Cambridge. Est. $5,000 bond. Noted June 6.

STEEL TOWER — **Springfield, Mass.** — Mt. Tom State Reservation Com., Court House, steel observation tower, 30 ft. high, with cement foundation, stairs, Mt. Tom, to D. A. Riedel, Easthampton. Noted June 27.

SWIMMING POOL—**Webster Groves, Mo.**—Algonquin Golf Club, Berry Rd., 35 x 95 ft., rein.-con. swimming pool, 3 to 9.5 ft. deep, to Rugg Constr. Co., Syndicate Trust Bldg., St. Louis.

ATHLETIC FIELD—**Brooklyn, N. Y.**—Bd. Educ., 500 Park Ave., New York, improving athletic field, Boys High School, to P. L. Moccia, $75,000. Noted June 13.

FERRY BOAT—**New York, N. Y.**—A. Goldman, comr. Dpt. Plant & Structures, Municipal Bldg., steel screw ferry boat, to Todd Dry Dock & Eng. Corp., 25 Bway., New York, $395,641. Noted June 13.

SHED — **New York, N. Y.** — M. Cosgrove, comr. Docks, Pier "A," Battery Pl., North River, shed on East 73rd and East 74th St. Dump, East River, to E. O. Roberts Co., 52 Vanderbilt Ave., $24,400. Noted June 20.

SUBWAY STRUCTURE—**New York, N. Y.**—Bd. Transportation, J. H. Delaney, chn., 49 Lafayette St., altering subway structure to permit widening roadway, to Woodcrest Constr. Co., Grand Central Terminal, $39,992. Noted June 13.

WALL—**New York, N. Y.**—Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, asphalt sidewalks along Laurel Hill Terrace High Bridge Park, to C. D. Beckwith, Seneca Ave. and Edgewater Rd., $4,622; wall around conservatory pond, Central Park, to A. M. Goldsmith, $20,889. Noted June 13.

COKE OVENS—**Johnstown, Pa.**—Bethlehem Steel Co., Bethlehem, general contract, 77 beaker coke ovens, coke handling equipment, to Koppers Co., Koppers Bldg., Pittsburgh.

LANDSCAPING—**Pittsburgh, Pa.**—Allegheny Memorial Park, Law & Finance Bldg., removing 125,000 cu.yd. dirt, top soiling 4 mi. roads, planting 1,000 trees, 15,000 shrubs, establishing lakes, pools, water supply, drainage, Thompson Run Rd. and Duncan Ave. extension, to Freeland, McHale, Patten, Inc., 1 Water St. To exceed $1,000,000.

CAMP—**Dallas, Tex.**—Grande Lodge Co., c/o M. M. Plowman, 1506 Arger Exch. Bank, 60 bungalets, 2 apartments, ch. store, building 65 x 125 ft. with garage in basement, oil station, recreation hall, swimming pool, laundry and office, Zangs Blvd., west of Viaduct, to Watson & Co., 1927 South Akard St., $260,000.

GRAIN ELEVATOR — **Port Arthur, Ont.** — Saskatchewan Elevators Ltd., general contract rein.-con. electrically operated grain elevator to Barnett-McQueen Co. Ltd., May St., Fort William. Est. $1,000,000.

SUBWAY—**Toronto, Ont.**—T. T. Irving, ch. engr. Canadian Natl. Ry., New Union Sta., general contract excavation, concrete work 1,300 ft. concrete subway on Bay Ave., York Twp. under Canadian Natl. and Canadian Pacific Rys., to Dufferin Paving & Crushed Stone Co., foot of Bathurst St., for York Twp., Canadian Natl. Ry. and Canadian Pacific Ry., Windsor Sta., Montreal, Que., J. M. R. Fairbairn, ch. engr., $145,000. Noted June 6.

VENTILATING BUILDING—**Windsor, Ont.**—Detroit & Canadian Tunnel Co., 527 Majestic Bldg., Detroit, Mich., ventilating building of Windsor-Detroit Tunnel, London St. E., to Spencer-White & Prentis, 4 East London St.

Materials

Proposed Work

ASPHALT—**Windsor, Ont.**—City, 465 tons asphalt in connection with paving program, $9,000. M. E. Brian, City Hall, engr.

Bids Asked

CULVERT PIPE and PLANT—**Iowa City, Ia.**—July 15, at office Auditor Johnson Co., 2,000 ft. corrugated culvert pipe, 650 gal. paint. G. M. Griffith, Iowa City, co. engr.

GRAVEL—**Shreveport, La.**—Aug. 1, by Police Jury Caddo Parish, 30,000 cu.yds. washed or sand clay gravel. J. T. Bullen, parish engr.

MANHOLES COVERS, etc.—**Baltimore, Md.**—July 16, by Bd. Awards, manhole and handbox covers, frames, for Bureau Mechanical-Electrical Service. W. Viessman, Municipal Office Bldg., engr.

ASPHALT—**New York, N. Y.**—July 15, by P. J. Dooling, comr. Purchase, Municipal Bldg., asphalt to Dpt. Water Supply, Gas & Electricity.

PORTLAND CEMENT—**New York, N. Y.**—July 17, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., 5,000 bags portland cement.

BITUMINOUS CONCRETE—**St. George, N. Y.**—July 17, by J. A. Lynch, pres. Richmond Boro, Boro Hall, 1,500 tons bituminous concrete in Dists. 1, 2 and 3.

ELECTRIC LIGHTS, etc. — **Ames, Okla.** — July 18, by T. E. Turnbeaugh, city clk., material for electric light distribution system, $6,000. Milliken & Whiteneck, Southwest Natl. Bank Bldg., Oklahoma City, engrs.

PIPE—**Providence, R. I.**—July 8, by City, Bd. Contr. & Supply, for 31,000 lb. lead pipe, 25,000 pig pipe.

LOADING SHOVEL—**Austin, Tex.**—July 29, by Travis Co., c/o J. A. Bilger, aud., 2½ or 2¾ cu.yd. full revolving loading shovel on caterpillar truck.

MAINTAINERS, etc.—**Coleman, Tex.**—Aug. 12, by Coleman Co., c/o C. L. South, judge, 1 or more pull type maintainers; 1 or more crawling type tractors, No. 30.

TILE PLANT EQUIPMENT—**Corpus Christi, Tex.**—Owner, c/o P. Hemphill, c/o Portland Cement Assn., Athletic Bldg., Dallas, in market tile plant equipment. $200,000.

TRACTORS, etc.—**Hillsboro, Tex.**—July 22, by Hill Co., c/o W. R. Brewington, aud., 1 or more 40 to 80 hp. tractors and 1 or more 8 to 12 ft. one man graders.

ROAD EQUIPMENT—**Houston, Tex.**—July 22, by Harris Co., c/o H. L. Washburn, aud., one-man maintainer.

TRACTORS—**Lubbock, Tex.**—July 22, by Lubbock Co., c/o R. H. Bean, co. judge, 1 or more 60 hp. caterpillar tractors.

STEEL PIPE—**Vancouver, B. C.**—July 22, by City Council, 57,000 ft. 4- to 12-in. c.i. pipe, $50,000. C. Brackenridge, City Hall, engr.

Contracts Awarded

RAILS—**Detroit, Mich.**—Dpt. Street Rys., St. Jean and Shoemaker Aves., 1,000 tons 100 lb. A.R.A. rail for municipal street railway system f.o.b. Detroit, to Bethlehem Steel Co., East 3rd St., Bethlehem, Pa., at $51.70 per gross ton for No. 1, and $49.55 for No. 2.

LIGNIN BINDER—**Trenton, N. J.**—State Hy. Comn., Trenton, 100,000 gal. lignin binder for surface treating gravel road, to E. L. Lantz, 1510 Greenwood Ave., Trenton, at $0.10 per gal.

See proposal advertising on page 128

Constr. News page 25

UNIT PRICES

Sewer—Syracuse, N. Y.

Board of Contract & Supply opened bids Apr. 29, sewers in Genesee and Gifford Manors. Bidders are: (A) James Passieno & Sons, (awarded contract); (B) J. H. Corbett; (C) Mando Co.

	A	B	C
Vitr. Pipe			
760 lin.ft. 33-in.	$8 96	$7 24*	$10 00
930 lin.ft. 27-in.	5 84	5 00*	7 00
800 lin.ft. 30-in.	6 28	5 39*	8 00
8,380 lin.ft. 24-in.	3 40	5 99	4 75
1,510 lin.ft. 18-in.	3 71	2 30	3 00
2,000 ft. 15-in.	1 41	1 80	2 00
5,000 ft. 12-in.	2 33	1 47	1 90
2,000 ft. 10-in.	2 25	1 43	3 00
16,700 ft. 8-in.	2 00	1 27	2.10
1,650 lin.ft. 10-in. (lateral)	1.00	1.00	1.60
7,600 lin.ft. 6-in. (lateral)	.85	.70	.70
5,700 lin.ft. 5-in. (lateral)	.85	.70	.70
29 3x4-ft. line manholes	78.00	75.00	100.05
12 4x4-ft. line manholes	82.00	85.00	100.00
20 4x4-ft. junction manholes	85.00	90.00	150.00
5 4x4-ft. drop manholes	90.00	125.00	175.00
20 3x4-ft. double line manholes	210.00	160.00	200.00
6 4x4-ft. slab top manholes	80.00	60.00	100.00
12 4x4-ft. double junction manholes	250.00	280.00	250.00
4 4x4-ft. double line manholes	250.00	180.00	300.00
1,000 lin.ft. timber and plank platform 24x33-in.	.66	1.39	.60
91 catch basins	40.00	35.00	45.00
1,000 lin.ft. timber and plank platform 12x18-in.	.26	.70	.50
1 connection with existing catch basin	5.00	5.00	10.00
2 connections with existing culvert	15.00	50.00	25.00
200 cu.yd. stone riprap	3.00	2.80	3.00
400 cu.yd. conc. Class "B"	7.00	9.00	10.00
200 cu.yd. extra excav.	.75	1.50	2.00
1,000 cu.yd. rock excav.	5.00	5.00	5.00
11 wing walls	225.00	199.00	175.00
3,000 cu.yd. crushed stone	1.50	1.70	1.25
1,000 lin.ft. 5x10-ft. rein. conc. culvert	30.20	35.96	37.00
3,000 cu.yd. channel excav.	1.00	.50	1.00
200 lin.ft. iron pipe railing	1.00	1.50	2.00
100,000 ft. lumber left in trench	50.00	50.00	50.00
Totals	$189,280	$192,012	$214,850

*Conc. pipe.

Engineering News-Record, Issue of July 11, 1929.

Paving—Bentonville, Ark.

City opened bids May 31 paving in District No. 7. Lowest three and highest bidders are: (A) L. S. Fisher Construction Co., Woodward, Okla.; (B) Altman-Rodgers Co., Cotton Exchange, Oklahoma City, (awarded contract*); (C) Reed & Wheelock, Pittsburg, Kan.; (D) Taylor & Allison, Chanute, Kan.

	A	B	C	D
12,500 cu.yd. excav.	$0.30	$0.40	$0.50	$0.40
25,400 sq.yd. fine grading	.04	.05	.05	.10
15,000 sta.yd. overhaul	.05	.04	.02	.02
Mesh reinf. over sewers, etc.	.30	.22	.28	.25
2,000 sq.ft. crosswalks removed	.04	.20	.05	.03
Conc. pav. without reinf.:				
16,800 sq.yd. (a) Uniform section	1.90	1.87	1.95	2.15
8,600 sq.yd. (b) Highway section	1.95	1.87	2.07	2.19
Conc. pav. with reinf.:				
16,800 sq.yd. (a) Uniform section	2.15	2.06	2.15	2.45
8,600 sq.yd. (b) Highway section	2.15	2.06	2.27	2.49
11,500 lin.ft. integral conc. curb	.30	.35	.15	.40
980 lin.ft. integral conc. header	.30	.30	.15	.40
100 cu.ft. conc. removed from exist. struct.	.20	1.75	.10	.20
20 cu.yd. reinf. conc. in structures	23.00	24.00	25.00	25.00
5 cu.yd. plain conc. pipe encasement	17.00	20.00	15.00	15.00
6 standard inlets	35.00	44.00	40.00	50.00
180 lin. ft. 15 in. pipe sewer	1.50	1.40	1.75	1.90
Totals—plain conc.	$59,075	$60,358*	$61,494	$69,083
—reinf. conc.	64,995	65,184	66,574	76,703

Engineering News-Record, Issue of July 11, 1929.

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Pier—Waukegan, Ill.

U. S. Engineer Office, 537 Dearborn St., Chicago, opened bids Apr. 15, rebuilding superstructure of South Pier, 552 lin.ft., concrete. Bidders are: (A) C. E. Carson Co., 601 St. Clair St., Chicago, (awarded contract); (B) Great Lakes Dredge & Dock Co., 104 South Michigan Ave., Chicago; (C) Nelson Bros. & Holthe, Muskegon.

	A	B	C
552 lin.ft. cutting down old pier	$25.00	$20.75	$35.00
899 cu.yd. conc.	24.00	29.20	33.00
27,945 lb. reinforcing steel	.7½	.7½	.10
28,980 ft. bm. timber	150.00	262.50	350.00
14,660 lb. drift bolts, screw bolts and tie rods	.15	.36	.34
2,000 short tons stone	4.50	3.80	6.00
Totals	$53,018	$60,286	$78,909
Price per lin.ft.	96.05	109.21	142.95

Engineering News-Record, Issue of July 11, 1929.

Road—Texas

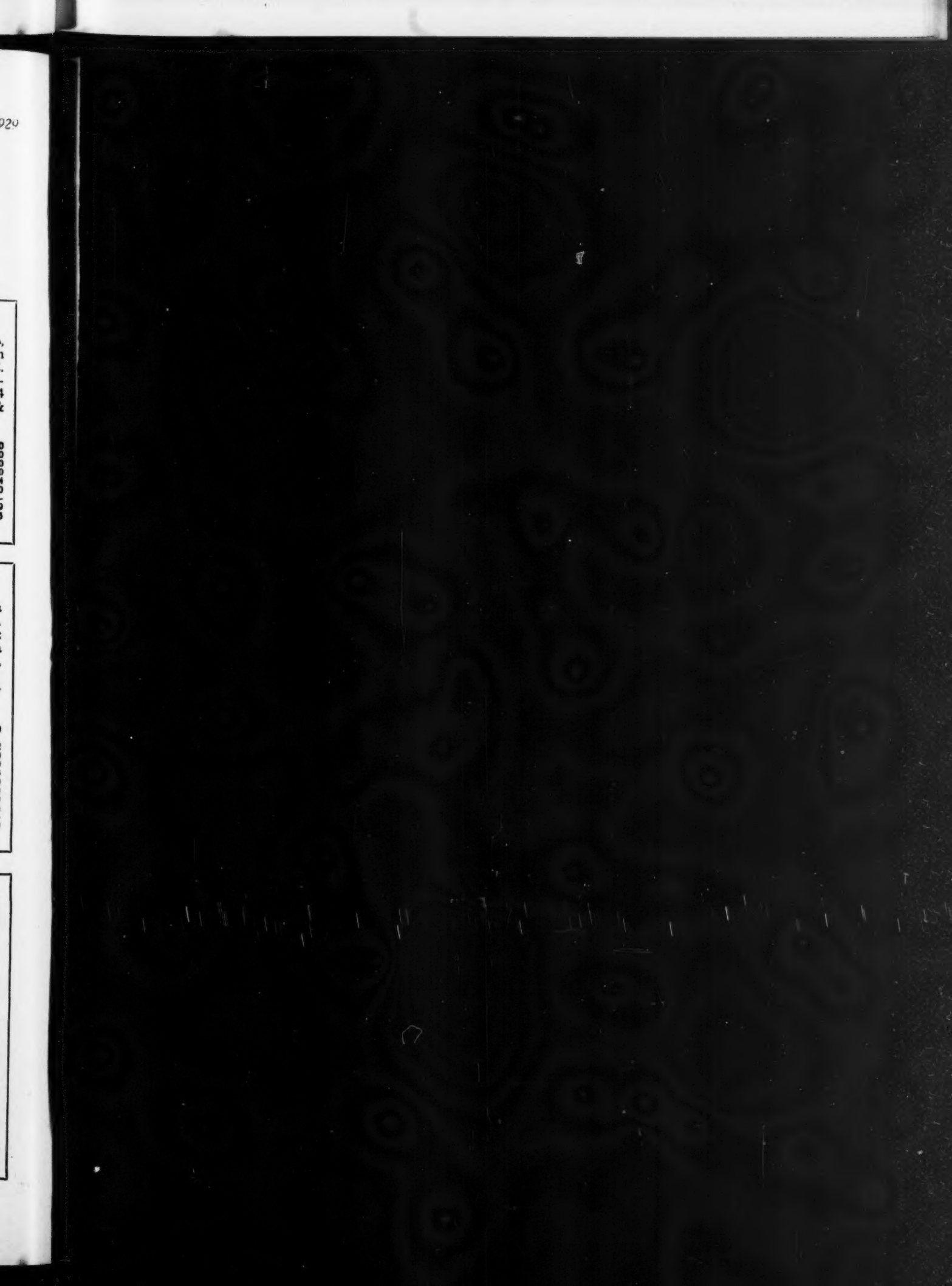
State Highway Department, Austin, opened bids May 24, paving with concrete 13.709 mi. F. A. P. No. 532-A and 527-B, Unit 2, Young Co. Bidders are: (A) Stuckey Construction Co., Box 1445, Wichita Falls, (awarded contract); (B) Standard Paving Co., Fort Worth; (C) H. B. Canady Co., Dallas; (D) Interstate Construction Co., Little Rock, Ark. G. Gilchrist, state highway engineer.

	A	B	C	D
280 cu.yd. culvert excav. Class "A"	$0.75	$0.50	$0.75	$0.50
225,202 sq.yd. fine grading, subgrading and shoulders	.015	.02	.02	.02
60 hours' extra rolling earthwork	.60	2.50	2.00	2.00
144,974.83 sq.yd. conc. pavement	1.91	1.91	1.93	2.00
300,961 lb. reinf. steel (pavement)	.028	.03	.03	.03
170 M gal. pounding and jetting	1.50	2.00	1.50	1.50
2,110 lin.ft. wire mesh guard fence	.50	.50	.50	.50
8.77 cu.yd. conc. Class "A"	17.50	30.00	18.50	18.00
688 lb. reinf. steel (structures)	.05	.05	.05	.05
Totals	$290,262	$292,291	$294,982	$305,119

Engineering News-Record, Issue of July 11, 1929.

Sewerage System—San Diego, Calif.

Common Council opened bids May 13 sewerage system in Point Loma District. Eight bids were received, difference between lowest and average, 23 per cent. Lowest three and highest bidders are: (A) Miracle Construction Co., 4751 Monroe St.; (B) R. E. Hazard Contracting Co.; (C) Stroud Bros. & Seabrooke; (D) J. D. Harms.

	A	B	C	D
68,445.5 ft. of 6-in. conc. main	$0.65	$0.87	$0.85	$1.05
17,166.6 ft. of 8-in. conc. main	.69	.95	.985	1.25
5,146.6 ft. of 10-in. conc. main	.83	1.15	1.09	1.50
6,318 ft. of 12-in. conc. main	1.10	1.35	1.30	2.25
3,447.3 ft. of 15-in. conc. main	1.46	1.60	1.46	2.50
84 ft. of 8-in. c. i. main	1.50	1.50	2.00	4.00
24 ft. of 16-in. c. i. main	3.69	5.00	6.00	6.00
93 dead ends	8.00	10.00	15.00	17.00
333 conc. manholes	60.00	67.00	77.50	75.00
27 drop manholes	99.00	77.00	83.00	110.00
1.3 cu.yd. conc. in piers	27.00	54.00	30.00	30.00
Pumping plant, settling tank and accessories	17,000.00	12,000.00	17,000.00	15,000.00
Outfall and appurtenances	5,332.00	4,000.00	4,806.00	10,000.00
Totals	$118,568	$137,456	$145,545	$178,925

Engineering News-Record, Issue of July 11, 1929.